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*Illustrated.

THE Pennsylvania Railroad has in the neighborhood of 3,000 all-steel passenger equipment cars in service—more than any other railroad. The observations of W. F. Kiesel, Jr., assistant mechanical engineer of that road, on the problems of steel passenger car design, which were expressed before the recent New York meeting of the American Society of Mechanical Engineers, and are reproduced on another page, are of more than ordinary interest. The most troublesome questions to be solved are whether the steel cars should be fitted with wood or metal lining, the problem of insulation, and the design and construction of the car to afford the greatest safety to the passengers when accidents occur. While wood interior finish has some advantages the use of metal is to be preferred, as pointed out by Mr. Kiesel and also by Mr. Koch, who read a paper on "Steel Interior Finish." Mr. Vaughan in his paper, which was reproduced in our issue of April 11, also suggested that the tendency in the future would probably be to adopt steel interior finish to a very great extent, and possibly entirely. The steel finish must, of course, be insulated to prevent radiation, and there is still more or less question as to the material to be used for this purpose and its method of application. Steel passenger cars have given a good account of themselves in wrecks, and the most important problem in this connection is the prevention of telescoping. Suggestions as to this were made in two of the papers which are presented in abstract in this issue—one on the "Use of Cast Steel," and the other on "Special Ends for Steel Passenger Cars."

AFTER having been the object of universal anathema all his life the "baggage-smasher" at last has found a friend who understands some of his difficulties. The Interstate Commerce Commission has rendered a decision sustaining with slight modifications the rules adopted by the carriers nearly two years ago, placing restrictions on the use of large-sized trunks and sample cases of the "wardrobe" and other freak types used mainly by traveling salesmen. The commission's order, which probably will be embodied in new tariffs to go into effect June 1, holds that the carriers may reasonably make an extra charge for the transportation of baggage exceeding 45 in. in length and may stipulate that baggage exceeding 72 in. in any dimension will not be accepted for checking; but it reduces the amount of the charge proposed from a rate equal to that for 10 lbs. of excess weight for each inch of excessive length to a rate equal to that for 5 lbs. An unusually vigorous campaign against the new uniform baggage rules adopted by the various railroad passenger associations in 1911 was waged by the commercial interests, including not only the trunk manufacturers, but nearly all houses employing large numbers of traveling salesmen. A great deal of newspaper publicity was inspired for the purpose of making the general public think it was going to be deprived of one of its privileges. The railways were willing to compromise but were insistent as to the necessity of checking the tendency toward large and freak-shaped trunks. The rules which the commission now holds reasonable represent more nearly those on which the railways were willing to compromise, but which the commercial interests would not accept, than those originally proposed, but the justice of the purpose of the rules has been fully upheld. The opinion is by Chairman Clark, who was himself in the train service long enough to understand some of the conditions under which baggage is handled. He not only shows that the personal baggage of the average traveler will be scarcely affected, but that "the questions presented in this case relate not to matters of revenue, but primarily to the physical limitations of the facilities of the carriers for the transportation of baggage, and to the conditions under which men engaged in this branch of the service must work."

IN the settlement of the recent controversy between the New England Telephone & Telegraph Company and its operators, at Boston, the company secured the adoption of an important

principle—that of the deferred payment of wages. The demands which had been made by the operators called for increases in pay, which, it is said, averaged one dollar a week, or, say, $50 a year. The agreement, as published, provides for the establishment of what are called anniversary payments. An operator will receive $25 at the end of her second year of service; $50 at the end of the third year, and of each year thereafter, until the end of the ninth, and then $100 at the end of the tenth, and of each succeeding year. The operators demanded the abolition of the split trick; the company agrees that this shall not be compulsory on any operator after she has served eighteen months. Under the agreement, there will be a permanent "adjustment committee," consisting of three operators and three representatives of the company. Holding back a part of an operator's pay until the end of the year will be a real novelty, well worth the attention of everybody interested in the relation of employer and employee. Probably those women are quite unsophisticated, from the labor leader's point of view; but in agreeing to this new idea they are doing a good thing for themselves, we have little doubt. It is a popular theory that a workman should have all of his pay when he earns it. He very naturally wants it. The labor leader advises his constituents to do nothing to put themselves in the power of the employer. He is jealous of the railway relief associations, and this jealousy has even shown itself in arguments against pensions, paid wholly out of the employer's treasury. But in spite of this theory the lesson of real experience is that every rational experiment in thrift proves highly beneficial to all concerned. Leaving a part of one's pay in the hands of the employer for a year is a practical and useful lesson in thrift. If it binds one to the employer in an unreasonable degree, the unreasonableness can be modified and adjusted. If the employer is at all overbearing or grasping there is little danger, in these days of socialistic state regulation by the state of everything done by a public service corporation, but that his injustice will be quickly punished or corrected. One of the best ways to increase the pay of railway employees, when an increase is justified, or is necessary, would be to put the increase, or a part of it, in the shape of an annual premium. If a manager doubts the wisdom of this, he can begin cautiously, with small amounts. In the railroad world experiments with premiums have been few and comparatively small, but the principle is a sound one. The fact that this idea has been neglected is no discredit to the principle.

GIVING employees of long standing the most favorable hours is another feature of the Boston agreement which should be of interest to railroad men. This clause, translated into terms of the trainmaster's business, would mean that the older freight trainmen, and as many of them as possible, should have regular runs, with approximately uniform starting hours, and that the smallest possible number of men should be required to run "first in, first out," never knowing for two days in advance when or where to prepare for the rest-periods. We are well aware that this will seem impracticable, and perhaps even absurd, to every one who looks upon the present freight train practice as right because it is universal; but, nevertheless, there is a principle in the matter of which we shall do well, now and then, to remind ourselves. And the principle which we have chiefly in mind is not that of favoring the older men at the expense of the younger, but rather the fundamental principle of nature that the normal man should have regular habits. In discussing questions of safety we theorize a good deal about the dangers of overwork and the importance of requiring trainmen to keep themselves always in good physical and mental condition; but, in actual practice, the life of the freight trainman is made as irregular as possible. It could not be worse in that respect. It is true that the conductor and brakemen can rest a good deal while on duty, and the fireman can keep awake because his arms and legs have to be kept in motion, but with the engineman the conditions are quite different. Irregular hours are not the greatest evil in the world, and if work time is short enough and rest time long enough adverse conditions can be coped with, after a fashion. But it is well to bear in mind that adverse conditions do really exist and that, if the issue should be raised, the railway manager would be held responsible for them.

THE TRAIN CREW BILL AND RAILWAY ACCIDENTS IN ILLINOIS.

A TRAIN crew bill is pending in the Illinois legislature, and there, as elsewhere, such legislation is being advocated on the ground of safety. The annual report of the Illinois Railroad Commission for the year ending June 30, 1912, comes out opportunely to show how ignorant or dishonest are those who advocate such legislation on any such ground. The commission on page 13 thus refers to the principal cause of railway accidents in Illinois as well as elsewhere: "Of the persons killed during the year *about 75 per cent.* were trespassing at the time of the accident, and of those injured *about 52 per cent.* were also trespassers . . . Responsibility for these casualties is chargeable to the parties injured and to the failure of law-making bodies to provide suitable laws for the punishment of those who use the property of hazardous industries as a public highway. Until some authority is exerted in this direction these casualties will continue."

While special classes, to promote their own supposed selfish interests, and peanut politicians, to get votes, promote various other kinds of measures to impose restrictions and burdens on railroads, the only persons who advocate legislation to stop trespassing are those who know the most about the causes of accidents, namely, the officers of the railroads and the railroad commission. Very little consideration can be expected to be given to trespassing by the law-makers. *Whose votes are to be gained by stopping a mere 75 per cent. of all the fatal accidents on the railways of Illinois?* It may be said that full crew legislation would at least tend to prevent some of the accidents due to other causes. We give below a table stating the causes to which the Illinois commission attributes all the fatalities on railways in that state in the fiscal year 1912:

FATALITIES ON ILLINOIS RAILWAYS IN YEAR ENDING JUNE 30, 1912.

Cause of Accident.	Employees.	Passengers.	Other Persons.	Total.
Train Accidents—				
Collisions	17	6	3	26
Derailments	18	..	1	19
Parting of trains	1	..	..	1
Locomotives or cars breaking down	4	..	..	4
Coupling and uncoupling	20	..	..	20
Falling from trains, locomotives or cars	37	2	32	71
Jumping on or off trains, locomotives or cars	18	4	42	64
Struck by trains, locomotives or cars.	167	..	..	..
At highway crossings	..	..	108	..
At stations	..	6	116	..
At other points along track	..	1	220	..
Total struck by trains, locomotives or cars	..	..	..	618
Struck by overhead obstructions	4	..	..	4
Other causes	16	2	27	45
				872
Industrial Accidents—				
Handling of traffic	3	..	..	3
Handling tools, machinery, etc.	7	..	..	7
Handling supplies, etc.	3	..	..	3
Other causes	12	..	3	15
				28
Grand total				900

Under the head "Other Persons" are included trespassers, and others not either passengers or employees. A vast majority of these "other persons" were trespassers. The man doesn't live who can point out any particular class of railway accidents here mentioned which would be reduced in the slightest degree by the addition of one man, or ten men, to the crew of every freight and passenger train.

It is notable that while the Illinois commission recommends various means of reducing accidents it makes no mention of the desirability of increasing the number of any class of railway em-

ployees. Why not brush aside the hypocritical pretense that train crew legislation is in the interest of safety, and baldly admit that its sole purpose is to increase the number of men that railways must employ? As safety legislation it hasn't a leg to stand on. As a means of ameliorating the condition of working people, something might be said for it, provided the legislation were made broad enough to increase the number of men that all classes of business men or concerns should be required to hire. There are few or no classes of laboring people who don't think they are required to do too much work. If the legislation is intended to promote purely social ends let us be consistent and require not only the number of men that railways must employ, but the number that farmers, merchants, manufacturers, miners, fishermen, housewives and newspaper publishers must employ to be increased.

If requiring the railways to employ unnecessary men is in the interest of progress and will bring the millennium nearer, how much more in the interest of progress, how much more adapted to hasten the millennium would be legislation requiring all classes of employers to increase the number of their employees by, let us say, 50 or 100 per cent.

THE REAL DANGER TO REGULATION BY COMMISSION.

As long as the public tried to control railways and other public utilities merely by inflexible laws interpreted and applied solely by the courts public regulation and its results were not satisfactory. It was long thought that the only alternative to such unsatisfactory control of public utilities was government ownership. Reasoning and experience have convinced many that both unsatisfactory public control and public ownership can be avoided by leaving public utilities under private ownership and management, while having their management and operation thoroughly supervised in the interests of the public by small bodies of experts in practically continuous session. The principal danger to the success of regulation by commission has been felt to be, both by its advocates and critics, that the managements of the concerns regulated would so resist and circumvent the commissions that their efforts to protect the interests of the public would be nullified. But the managements of most public utilities have in recent years been manifesting a disposition to bow to what they have deemed the inevitable. They no longer oppose and resist regulation by commission itself, but merely the minority of requirements and orders which they regard as very unreasonable and unfair.

Experience is showing that the real danger to regulation by commission is the attitude and course of governors, law-making bodies and the public. As has been indicated, the theory on which regulation by commission is predicated is that commissions will be composed of experts, who will be in practically continuous session, and who will, therefore, be best able to solve fairly and salutarily the problems arising out of the relations between public service corporations and the public. In order that opportunity shall be afforded for this theory to be fully tried it is necessary that regulatory laws shall be drafted in broad and general terms and that the duty of enforcing and administering them in detail shall be delegated to the commissions. This enables the commission to consider the circumstances of each case and to adapt its requirements and orders to them. Every law passed, whether by a legislature or Congress, that prescribes in detail the rates that railways or other utilities may charge, or the way they shall be operated, limits the field within which the commission may fruitfully make investigations and exercise its supposedly sound and expert judgment.

Such interference with regulation by commission is constantly going on and seems to be increasing. The people in some states, as in Oregon and Arizona, have fixed classifications and rates by referendum, although these states have commissions created and maintained expressly to deal with such matters and supposed to be competent to do so. The legislatures in many cases have passed laws to fix rates, and in many more recent instances have passed laws prescribing the number of men that the railways must employ, the hours they must work, etc., although in the states where these things have been done there were commissions which, if the theory of regulation by commission is correct, were most fit to deal with the questions involved. The state of New York has two public service commissions composed of five men each who are paid an annual salary of $15,000 a year, a total of $150,000 a year. When a train crew bill was pending in the legislature, and when it was later in the hands of the governor, the railways urged that the question be left to one of these commissions. But the bill was passed and signed. If governors and legislatures are more competent to settle such matters than commissions, it is clearly a waste of public money to maintain the commissions.

One of the necessary effects of interference with the work of the commissions by the public, the law-making bodies, the governors and—if he should interfere—by the president, is to make the concerns regulated lose respect for the commissions. They can hardly be expected to have much respect for them when the public and public officials show disrespect for them. A second effect is to make the commissions lose respect for themselves and to reduce their sense of responsibility, necessary consequences of which must be to make self-respecting and able men unwilling to serve on them, thereby deteriorating their personnel, and to make those who do accept membership perform their duties less conscientiously and thoroughly. A third effect is one already mentioned, namely, the restriction of the field for the exercise of the commission's judgment. Finally, the legislation resulting from such interference is almost certain to be either invalid, or vicious, or both. It imposes requirements and burdens regardless of differences of conditions; and therefore while it may be just as applied to some conditions, it is almost sure to be unjust as applied to most conditions. The purpose of such interferences with regulation by commission almost invariably is to impose some requirement or burden on the concerns regulated which does not commend itself to the intelligence and judgment of the commission. The modern regulating commission is seldom or never unduly favorable in its attitude toward the corporations under its control. When, therefore, it refuses to adopt any form of regulation that may be demanded it usually has very strong reason for believing that to do so would be contrary to justice and to the interests of the public; and if the motive of the promoters of regulation that commissions do not favor be investigated it will very often be found to be a desire to secure some form of special privilege for their own class at the expense of the public.

The function of the regulating commission is, in the interests of the public welfare, to stand between public utility corporations and all other classes, and insist on such relations being established and maintained between them as will best promote the interests of the whole public. The public itself is undermining the commissions, and preparing the way for the failure of regulation by commission, when it lets legislators and governors huckster legislation affecting public utility corporations in exchange for the votes of certain interested classes instead of insisting on the commissions being left free to perform their difficult, onerous and important duties without unnecessary interference.

DELAWARE & HUDSON.

In the annual report of the Delaware & Hudson for the calendar year 1912 President Loree comments on some figures taken from the reports to the Interstate Commerce Commission for all railroads in the United States for the years 1907 and 1911. These figures indicate that the total investment in railroad property devoted to public use was in 1911 $2,044,400,000 in excess of the investment in 1907, and that there was available for interest and dividends approximately $9,000,000 less in 1911 than in 1907. These figures are only available down to June 30, 1911. The Delaware & Hudson's own figures for the calendar year 1912 bear out to quite a remarkable degree the

point that Mr. Loree makes in regard to figures for all of the roads.

In 1912 the railroad department of the Delaware & Hudson earned $22,480,000, or $1,058,000 more than in 1911, but the net operating revenue in 1912 was $8,413,000, or $250,000 less than in 1911 and during 1912 the company spent for additions and betterments $2,927,000, while during that year the amount of stock outstanding remained the same, and at the end of 1912 there was $58,171,000 bonds outstanding, which is less by $204,000 than the amount outstanding at the end of 1911. At the beginning of the year there was $597,000 carried as a special deposit to pay the cost of authorized additions and betterments, which amount was expended during the year, and in addition considerable advances were made to subsidiary and other companies as shown by an increase in bills and accounts receivable of from $2,790,000 at the end of 1911 to $4,118,000 at the end of 1912. Loans payable at the end of 1911 amounted to $900,000, and at the end of 1912 to $3,500,000. Therefore while gross has increased net has decreased, and while investment in property has increased less return has been earned even on the investment at the beginning of the year. The Delaware & Hudson has far better credit, and its earning power in relation to its capitalization is far greater than the great majority of American railroads. Nevertheless investment conditions were such that the company preferred to borrow short time money rather than try to finance its improvements.

The D. & H. operates 878 miles of road, of which 328 miles has second track. Next to the Delaware, Lackawanna & Western it carries a greater proportion of anthracite coal than any other road. Of the total tonnage of revenue freight carried in 1912, 62.83 per cent. was furnished by products of mines, and of this tonnage amounting in 1912 to 12,138,000 tons, 8,010,000 tons was anthracite coal. The Delaware & Hudson is a road having a very heavy freight density, especially when the comparatively small amount of second track is taken into consideration. In 1912 the ton miles of revenue freight carried per mile of road averaged 3,222,000. Like the Delaware, Lackawanna & Western, the Delaware & Hudson gets a good ton mile rate, the average in 1912 being 6.6 mills, comparing the average in 1911 of 6.8 mills.

The passenger business on the Delaware & Hudson does not furnish a very large proportion of total revenue and a very considerable part of it is made up of commutation business. Total receipts from passenger traffic in 1912 amounted to $3,077,000, which is an increase of only about $57,000 over 1911. The revenue from commutation ticket sales alone amounted to $1,194,000 in 1912, which is about $39,000 more than in 1911.

As already mentioned, the total operating revenue increased last year over the year before by a little over $1,000,000, the increase in revenue from coal freight traffic being $499,000, and from merchandise freight traffic $423,000. The total revenue in 1912 from coal freight traffic was $10,346,000, and for merchandise freight traffic $8,477,000. The increase in revenue from freight was due entirely to a longer average haul. In 1912 the total tonnage of all revenue freight amounted to 19,319,000 tons as against 19,888,000 tons in 1911. The average revenue per ton per mile was slightly less, while the average distance each ton was carried was 146 miles, or over 15 miles greater than in 1911. The principal changes in the classes of various commodities carried were a decrease of 1,286,000 in the tonnage of anthracite coal, and an increase of 399,600 in the tonnage of the bituminous coal; an increase of 152,000 in the tonnage of miscellaneous commodities, an increase of 149,000 in the tonnage of lumber, and an increase of 38,000 in the tonnage of merchandise.

The increase in operating expenses from $12,758,000 in 1911 to $14,067,000 in 1912 was due largely to an increase of from $1,489,000 in 1911 to $1,940,000 in 1912 for maintenance of way, and from $7,414,000 for transportation expenses in 1911 to $7,979,000 in 1912. The increase of maintenance of way expenses is due in part to the very severe weather in January and February, 1912, and also in part to charges for maintenance due to a rather extensive program of replacement and strengthening of bridges, trestles and culverts. While, of course, only the replacement value of a wooden bridge, whose place is taken by a permanent structure, is charged to maintenance, and the additional cost to additions and betterments, the replacement of wooden structures by permanent structures adds materially to maintenance costs during the years in which such work is being done. Such a program of betterment, however, should in the long run tend to reduce maintenance charges. As Mr. Loree points out, the increase in transportation expenses resulted largely from the increase in business (ton mileage) handled, although increased cost of fuel also contributed toward added transportation expenses. This increase in transportation expenses was despite an increase of 35 tons in the average revenue train load, the train load in 1912 being 502 tons. The heavier train load was obtained in part through a slightly greater number of loaded cars per train, but principally through better car loading. The average tons per loaded car in 1912 was 25.72, an increase over 1911 of 1.41.

Although the net operating revenues of the railroad department were less in 1912 than in 1911, the profits from the coal mining department offset this decrease—the gross income from the coal department amounting to $1,024,000 in 1912, as compared with $284,000 in 1911—so that the company had a net income of $5,506,000 in 1912 as compared with $5,238,000 in 1911. The regular dividend of 9 per cent. calling for $3,825,000 was declared payable quarterly in 1913.

The following table shows the principal figures for operation in 1912 as compared with 1911:

	1912.	1911.
Average mileage operated	877	877
Coal freight revenue	$10,346,095	$9,847,194
Merchandise freight revenue	8,476,851	8,053,788
Passenger revenue	3,076,507	3,019,230
Total operating revenue	22,380,103	21,421,817
Maint. of way and structures	1,940,352	1,488,757
Maint. of equipment	3,230,742	3,060,739
Traffic expenses	289,754	250,285
Transportation expenses	7,979,041	7,414,071
General expenses	626,889	544,307
Total operating expenses	14,066,779	12,758,159
Taxes	600,944	562,410
Operating income	7,812,380	8,101,248
Railroad operating income	9,081,799	9,476,245
Net railroad income	4,411,863	4,890,578
Gross coal department income	1,023,868	284,219
Net income	5,506,089	5,237,681
Dividends	3,825,270	3,825,270
Surplus	1,680,819	1,412,411

NEW BOOKS.

Book of Standards. National Tube Company, Pittsburgh, Pa. 559 pages, 4 in. x 6½ in. Price, $2.

This book is strictly a pipe handbook, is printed on thin paper so that it is not quite ⅝ in. thick, and is a handy size for pocket use. Several pages are devoted to a descriptive article covering the main process of manufacturing both welded and seamless tubes. There are a number of pages which give weights, dimensions, threads per inch, test pressures, sections of joints, specifications, etc., of the various kinds of pipes and tubings. Several pages describe, illustrate and contain tables in regard to lap-weld and seamless tubes, upset and expanded, wrought pipe bends, butted and strapped joints, etc. Considerable prominence is given to strength of tubes and cylinders under internal fluid pressure and collapsing pressures. Considerable attention is devoted to the mechanical properties of solid and tubular beams, of usual and unusual shapes. Chapters are included giving information in regard to water, gas, steam and air. It has not been the intention to go very deeply into these various subjects, only in-so-far as they concern tubular products. There is a large collection of tables, such as fifth roots and fifth power, decimals of a foot for each 1/64 of an inch, etc. Several pages are devoted to area and weight factors for tubes and pipes. A table showing properties of tubes and round bars is given with an explanatory article. The Metric system is included with conversion methods for most of the more commonly used measures, including temperatures. A glossary of terms used in the pipe and fittings trade will also be found.

Letters to the Editor.

PROPER BASIS OF STATION AGENTS' PAY.

Rapid City, South Dakota, April 3, 1913.

To the Editor of the Railway Age Gazette:

The editorial in your issue of March 28, relative to the salaries of station agents, is very good, particularly wherein you say that "an efficient agent should have his pay slightly increased every few years."

Having been in the station service for one company for a number of years, I can appreciate very much your statement on this subject. We all admit that the station agent is one of the poorest paid employees, if not the very poorest, in the railroad business. We seldom hear of an agent getting an increase in salary except when it is forced by other organized employees (the telegraph operators). Through the efforts of this organization telegraph operators have from time to time been given an increase and the agents sometimes fall into a slight advance in their salaries, made, perhaps, that the agent's salary may not become smaller than that of an operator in the same office. I have found that very few agents were ever given an increase in pay simply on account of their merits. No matter how popular a man he may have become in the town or city in which he is located, or the amount of business that he may be able to control on account of his personality and acquaintance with his people, we seem to think that the only way in which we can take care of this fellow is to transfer him to some better station. It seems to me that this is all wrong and that it would be a better business principle to increase from time to time the salary of every first class, efficient agent, and keep him where we feel he will do the most good. What does a small increase in salary matter to a railroad company, or any other enterprise, when given to the man who has the stuff in him to get out and grab the business from the other fellow. Of course, I do not believe that a station should pay the same salary to a new man just taking hold, when it has been made vacant by one who has been tried and tested, but when you get hold of the right sort of an agent, try and keep him, if possible, by making it an object for him to stay. I think that when this policy is adopted we shall find the standard of the station agent will be much higher, and better results will accrue to the company.

Regarding the fixing of the number of helpers for a station, you say that "the superintendent must know very much more about the work, at some of his stations, than superintendents usually know." How true this is; and how few superintendents are really familiar with the detail working of a local agency. The percentage of agents who have worked up to a position as superintendent is so small you can hardly see it. It seems to be an established rule that we can make good superintendents out of almost any material except that coming from the station service, and when we find one who has come up from this department there is something extraordinary in the history of his advancement. Now, we all know that, when word is sent along the line to reduce expenses, about the first cut that is made is in the helpers at the stations. How many of the poor under-paid agents have their help cut down to a point where it means that there is absolutely no time for them to be out of their office looking after prospective business; and yet the getting of one shipment might pay the monthly salaries of several helpers.

When we get hold of the right kind of an agent, and the majority in the larger stations are of this sort, the superintendent should keep "hands off" to a great extent, in the hiring and discharging of his help; and when it comes to reducing expenses superintendents should rely more upon the judgment of the local agent, as to whether or not he can reduce his force without materially hurting his business. From my experience I have found that the trouble with the average superintendent is that he is too narrow. That is, he seems to feel that there is really but one department to a railroad and that his—the operating department; that it matters very little how much or how little business his division does if he can simply show a reduction in operating expenses over some other division. It has always seemed to me that the traffic department should also take more of a hand in these matters than it usually does; for I am free to confess that when it comes to the question of looking after the business interests of a railroad the traffic department has little to say. If the operating department thinks that half of a present force can do the work at a strongly competitive station down goes the force, regardless of the amount of business and revenue lost by so doing.

D. H. Crary,
General Manager, Rapid City, Black Hills & Western R. R.

AIR BRAKE HOSE.

Passaic, N. J., March 18, 1913.

To the Editor of the Railway Age Gazette:

At the International Rubber Conference, held in New York in 1912, considerable effort was expended in getting from the chemists and testing engineers of the railroads a thorough presentation of the subject of air brake hose. The success which resulted from this effort may be best judged by those who attended the sessions of the conference.

Several points were, however, brought out, and as these have not appeared elsewhere in print, it may be well to state them here. It was stated that the price of air brake hose was between 35 and 45 cents a foot. One railroad had offered to pay 45 or 50 cents a foot provided the hose lasted proportionately longer. One railroad observed that rubber manufacturers wanted to "land the bid" at any price, and after that the quality was adjusted to fit the price. One manufacturer observed that railroad purchasing agents wanted the "cheapest" hose and that therefore the quality was no object. One railroad observed that the rubber goods manufacturers frequently tried to deliver air brake hose which had been previously rejected because of defects. One chemist stated that there never was any good reason for the rubber manufacturers fighting the "1903 Specifications" except that they desired to manufacture a cheaper grade of hose.

The rubber goods manufacturers' chemists, who posed as experts for the Master Car Builders' Association, have little or no knowledge of the conditions under which air brake hose and steam hose are used. One manufacturer said that if superior air hose were made, he could not find a market for it.

What I wish to show is this: The eight statements quoted above cannot all be totally correct. They are obviously conflicting and it remains for either vendor or purchaser of the material to settle down and arbitrate the matter in a way which will be a credit to both sides. The importance of air brake hose in car equipment is far too great to admit of a trivial discussion of the subject, and our serious minded rubber goods manufacturers should hasten to produce for the railways a material which will give the best service consistent with the price which the railway officers are willing to pay. Two railways, at least, are today obtaining comparative satisfaction by means of carefully drawn specifications, and it might be well for the other larger transportation companies to go at this problem with some of the vim which they have expended on other large difficulties. The tests for bursting, stretching, friction, and (for steam hose) steaming, have put into the hands of the motive power superintendent considerable valuable information, which need only be sorted out and criticised in order to become of immediate use for the preparation of adequate specifications.

Truly the problem of air hose and steam hose presents great possibilities to our railway departments for purchasing and testing, and publication of results obtained will go a long way toward improving the quality of these materials.

Frederic Dannerth,
Consulting Chemist.

MORAL CHARACTER IN THE ADMINISTRATION OF DISCIPLINE.

CHICAGO, April 11, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I note an editorial in your issue of April 4—commenting on R. T. Scholes' letter dated February 17, appearing in the same issue. Mr. Scholes is probably not aware that Mr. Kruttschnitt adopted on the Harriman lines a test of employees in advance of "Publicity for Accidents." He fully appreciated that it was as necessary to train the officials as the other employees, if the desired results were to be obtained.

There is in vogue on the Harriman lines and the Illinois Central "surprise" or "efficiency tests," a certain number of which are required to be made by the division officials each month, including the superintendent, and occasionally the general superintendent or general manager. These tests are clearly outlined to cover every phase of train operating conditions, which have to do with safety of trains and the prevention of accidents. The results of these tests reach those highest in authority, not only in regular reports, but in graphic charts showing the comparative efficiency of each division.

In addition to this an expert operating official on the staff of the highest operating official is employed as an inspector of transportation and authorized to make additional tests on any division of the road at any time. He is constantly employed in this capacity, which gives assurance to the management that not only the subordinates, but the officials themselves are complying with the rules and compelling compliance therewith.

The employees do not take kindly to the "surprise tests," but can find no reasonable objection, except that in some cases it is alleged the tests are made hazardous to the engineer by confronting him with a condition which, if real, would mean an accident; for instance, changing the switch lights to show red at a facing point switch on a curve. Confronted suddenly with the seriousness of such a situation, he might be impelled to jump off the locomotive, in the application of the first law of nature—self-preservation. It is entirely unnecessary and unwise to include such conditions in the "efficiency tests." The instructions of the Illinois Central on this subject read in part as follows:

> In no instance must tests be made where there is the slightest risk of creating a hazardous situation, or where undue alarm will be given those concerned, such as turning light on facing point switch, nor should they be made under circumstances which will cause unwarranted delay to the trains, nor subject them to the possibility of break-in-two in starting or severe application of brakes in stopping; for instance, on heavy grades. The location selected should be one where the danger signal can be observed a sufficient distance ahead to make absolutely unnecessary an emergency application of air.
>
> If indecision on part of the crew is causing too much delay, or after proper observance of rule has been rendered, to avoid as much delay as possible, the individual making test should notify the conductor that it is a test and that he may proceed with the train.
>
> Conditions should not be created which are unfair to those being tested.
>
> The test reported must be the result of conditions pre-arranged by the individual making same, and not from purely observations on their part of the performance of train and enginemen under circumstances which are otherwise created.
>
> Proper entry will be made on personal record card for failure to comply with the rules involved in these tests; the severity of such entry depending on the merits of each case.

It seems to me that the much discussed influence of the organizations in resisting discipline, or a disposition on the part of operating officials to "wink at chronic disobedience of exactly the same kind," can very easily be overcome by the use of "efficiency tests" and "publicity for accidents."

There does perhaps exist incompetency on the part of operating officials and a lack of "moral character in the administration of discipline"—not, however, to any greater extent than in other lines of business, or, if you please, in the army. If the discipline of the latter was as loosely administered and depended on the caprice of the individual who applied it, there would be utter demoralization.

I had occasion some few years ago to be thrown in the company of a general officer, who commanded a department of the United States army. In arranging matters in connection with some army maneuvers I had occasion to ride with him over the road when he observed railroad methods. I was struck with the remark he made one day: "You ought to have fine discipline on the railroad, for the reason that you can get rid of a man who is objectionable. This we can not do in the army. With the officer or private there is a certain *modus operandi* which prevents the elimination of those who do not flagrantly violate the rules of the war department."

There are very few exceptions to the general rule that railroad officials are selected by reason of their experience and capacity for increased responsibility. I will venture the assertion, without fear of successful contradiction, that the moral character and habits of the American railroad officer will rank as high as those of any other country or of the army of this or any other country.

To put forth the difficulty of administering discipline as being the resistance of labor organizations is simply an excuse for those who, for certain reasons, are unable to maintain their discipline. There is no question but what it requires considerable backbone rigidly to enforce the rules. The business conditions of a large part of the state of Georgia were recently thrown into confusion and much time and money was expended by those not connected with the railroad in an attempt to maintain discipline. The final analysis of the case by Governor Brown was to the effect that if a similar experience confronted him again he would use the entire power of the state to support the officials in maintaining discipline.

I think this is the sentiment throughout the country. The difficulty, however, seems to be that for one reason or another unreasonable concessions are made, or the superintendents are not backed up in the application of their discipline, which naturally encourages those who are employed to look after the interests of their constituents—the chairmen of the general grievance committees—to push in further than they know they have a right to go. This is human—"if you give an inch he will take an ell." If, however, properly and justly restrained, there is no difficulty in controlling this situation.

To operate the railroads without rules for the conduct of officials is naturally a difficult matter. The rules of war are very old—the rules of railroading comparatively new. The duties of officials on most roads are at present unwritten laws. As we grow in the refinement of the service, there must be developed certain well defined and standard lines of action. The nearest to those that should obtain among those heretofore evolved are embraced in what follows from Mr. Kruttschnitt's ideas as to the "surprise tests" and "publicity for accidents," both of which tend to impress upon, not only the employee, but also the operating official, his responsibilities.

In the daily application of "surprise tests" there is little hope for the official who is lacking in "moral character in the administration of discipline" to evade his responsibilities. The percentage of efficiency of his division, the individual cases of violations of rules and all of the circumstances connected therewith in the report made of each test, indicate clearly to the managing officer whether the rules are being observed or not.

Notwithstanding all such precautions there will occasionally occur accidents which are deplorable and uncalled for. These can be, in nearly every case, traced to the human equation, the negligence of duty unexpected and hard to account for, the dereliction of duty on part of the men who have perhaps been in service for many years with perfect records. These cases will undoubtedly continue as long as railroads are operated—whether we have automatic signals, interlocking or automatic control. It is human fallibility and is not manifest in railroad work alone. It is the cause of death and injury to people in every walk of life, and seems to have been a chronic trouble of the human family since Mother Eve ate the forbidden apple. It will probably become right again with the millennium.

W. L. PARK,
Vice President, Illinois Central.

FREIGHT RATES BY WATER AND BY RAIL

A Comparison in Which, for the First Time, There Is Available Adequate Data in Regard to Water Rates.

By J. L. Payne,
Comptroller of Statistics of Canada.

Although Canada and the United States have spent hundreds of millions for the development and maintenance of their inland waterways, and these waterways are the mediums for an annually increasing volume of commerce, up to the end of 1912 neither country was in possession of authentic data on which a fair comparison of freight rates by water and by rail could be made. It is all the more astounding that this should be the case in view of the fact that carriers by water have been operating on this continent for two or three centuries. The steamboat antedates the locomotive. The only excuse that could be advanced for this neglect is wholly inadequate, namely, that the inland marine interests of the two countries have never been organized on a reporting basis. If one should quite naturally ask why railways have been compelled to disclose in minute detail all their business operations, while steamboat owners have not been required to make any report at all, I am afraid it would be impossible to give a satisfactory answer.

If today anyone should, quite properly, ask the amount of capital invested in the carrying trade of the Great Lakes—to say nothing about other inland waters—the volume of freight transported annually, the earnings and operating expenses, the number and aggregate tonnage of vessels engaged in this vast service, the number of employees and their yearly remuneration, or for other items of pertinent information, I do not know from what source the answers could be got. They are not available at either Washington or Ottawa. Just why, as has been said, no one can tell. It cannot be assumed there are considerable, much less insurmountable, difficulties in the way. The Interstate Commerce Commission took the matter up three or four years ago, and prepared tentative schedules and classifications; but further steps have apparently been deferred. At all events, statistics based thereon are not at this moment to be had. The officers in charge of the American canal at Sault Ste. Marie have published from time to time figures in relation to the value of freight moved on the Great Lakes, the transportation charges, the ton mileage, and so on; but these figures have been mere approximations, based on other than direct returns of facts. They have no significance under such circumstances.

In this situation the Canadian Department of Railways and Canals decided to make an effort to at least ascertain the freight rates charged by carriers using the waterways under government control, and the task was assigned to me as a part of my regular official duties. An exceedingly limited schedule of questions was prescribed for the year 1912. The operators of steamboats were asked to indicate on each ship's report, delivered at the first canal office reached on a voyage, the rate of freight charged on cargo. As the starting point and destination were also recorded, the ton mileage could be readily figured out, and from all the data thus gathered during the year it would be a simple matter to calculate the average rate per ton per mile. That was the end aimed at. In any case where a vessel owner felt that it would be unsafe to confide such information to the statistical officer at the canal office, it was provided that he might send to Ottawa a periodical statement of his operations—say weekly or monthly. All carriers were also notified that at the end of the season of navigation, and not later than January 15, 1913, they were required to send to the department a report showing: (1) Aggregate tonnage of freight for the year; (2) ton miles of loaded vessels, and (3) gross earnings on freight. Thus one set of figures could be checked against the other.

It was not deemed expedient to ask for more than this at the outset. In the absence of special legislation on the subject, it was felt that any attempt at comprehensive or analytical statistics might lead to delay and resistance. The matter had to be approached in such a way as to win the cheerful co-operation of carriers by water; for it was known that the latter had long realized, for their own purposes, the need of reliable statistics in relation to the waterborne traffic of the Great Lakes. They were quite as much in the dark as was everybody else. Let it be said at once that the methods adopted were successful. The response of ship owners, having regard to all the circumstances, was prompt and candid. If absolutely complete returns were not received, that was wholly due to the short time allowance rather than to reluctance. An immense mass of data was sent in through the daily ships' reports, the periodical statements, and the annual return. All this was tabulated, and has yielded specific information of the greatest value in its bearing on the transportation problems of this continent. It has, at all events, the merit of being original and timely.

In order that the full significance of the information to which allusion has just been made may be appreciated, it will be necessary to have clearly in view the volume and character of the commerce of the international inland waterways of North America—for this matter is of just as much concern to the United States as it is to Canada. The following tabular statement, showing the total tonnage of freight through the American and Canadian canals at Sault Ste. Marie, at five year periods, will be illuminating:

	Tons.		Tons.
1887	5,494,649	1902	35,961,146
1892	11,214,333	1907	58,217,214
1897	18,982,755	1912	72,494,470

It will be seen that there has been an increase of 1,219 per cent. within 25 years; and yet these figures do not include the entire freight business of the Great Lakes. The trade of Lake Michigan, for example, embracing large shipments of grain from Chicago, does not pass through any of the canals, and is therefore not brought into the record. To a very large extent the tonnage just indicated might be regarded as representing the through waterborne business between the head of Lake Superior and eastern ports; and this through business has certain more or less fixed characteristics. The eastbound, or down, traffic is much larger than the westbound, and this fact has an important bearing on the rate of freight per ton per mile. Vessels are ready to carry cargo upbound at an exceedingly low rate rather than travel empty. In 1911—the last year for which full details in that regard are before me—a little over 68 per cent. of all the freight tonnage was eastbound. So far as the Canadian canal at Sault Ste. Marie was concerned, the down cargo represented 83 per cent. of the total—and the Canadian canal, it may be observed, handles 20 per cent. more business than does the American.

It must not be supposed, however, that these percentages in any respect have reference to the nationality of the traffic itself. As a matter of fact, only 10.3 per cent. of all the freight tonnage which passed through the Canadian canal at Sault Ste. Marie in 1912 belonged to Canada. It is not known what was the division at the American canal. A record is not kept of the facts in that relation. Just why, is not known. In 1908 the Department of Railways and Canals began to make a separation of American and Canadian business through all the canals of Canada, and following has been the result:

	Canadian. Tons.	American. Tons.	Total. Tons.
1908	5,012,147	12,490,673	17,502,820
1909	7,378,057	26,342,691	33,720,748
1910	7,883,614	35,106,994	42,990,608
1911	7,792,907	30,237,446	38,030,353
1912	9,376,529	38,210,716	47,587,245

This situation is almost wholly confined to Sault Ste. Marie, where, as has been said, American freight tonnage passing through the Canadian canal in 1912 made up 89.7 per cent. of the total. At the Welland Canal, Canada had 54 per cent. of the aggregate. The St. Lawrence canals, with a gross business of 3,477,188 tons, showed 67 per cent. attaching to Canada. For all the canals of Canada, however, it is a significant fact that more than four-fifths of the gross traffic is distinctly and wholly American.

Coming now to the consideration of the freight rate by water for 1912, it will be convenient—in fact necessary in a large sense—to separate American and Canadian traffic, although the facts will be given with regard to both. It must first be explained, however, that the 9,376,529 tons of Canadian freight indicating in a preceding paragraph was not the net tonnage. That figure represents the aggregate of all the canals and for that reason there is repetition. For example, a cargo from Fort William to Montreal is recorded first at Sault Ste. Marie, then at the Welland, and lastly at the St. Lawrence canals. The actual net tonnage was 6,942,278. Leaving out a salt water canal in Nova Scotia, and a small canal in Manitoba, these figures are reduced to 6,771,920, to which the inquiry of 1912 had reference. Complete returns were received with respect to 6,292,661 tons, or 93 per cent. of the total. It is confidently asserted that the result would not have been materially affected if the remaining seven per cent. had been reported. The ton miles for this volume of business amounted to 3,286,187,160, and the gross earnings to $6,378,893.43. Using these factors, it will be seen that the average receipts per ton per mile were 0.194 cent. The average earnings per ton were 91.04 cents.

The net American business through the canals of Canada in 1912 amounted to 36,840,812 tons, and returns were received covering 26,030,661. Details with regard to several millions of additional tons were sent in too late to be incorporated in the official report. The number of ton miles was 21,799,392,809, and the freight earnings amounted to $14,617,368.60. The average rate on this business was 56.62 cents per ton, and .067 cent per ton per mile.

The first thing to strike the reader will be the very considerable difference between the freight rate on Canadian traffic and on American traffic. The former was 189 per cent. higher than the latter. A statement of the facts will, however, explain this disparity. Of the 36,840,812 tons of American business through the canals of Canada in 1912, no less than 34,079,692 tons consisted of iron ore and coal—the ore eastbound and the coal westbound. The transportation of this ore is not on a commercial basis. It is for the most part done in steamers built for the purpose, owned and operated by the iron interests of Pittsburgh. The maximum freight rate returned for the season was 55 cents per ton. The same vessels carried back coal at 30 cents per ton. These rates were being returned side by side with rates of $1 and upwards per ton on wheat passing over practically the same route. While wheat was earning $2.57 per ton to Montreal, iron ore to Lake Erie ports was earning but 55 cents and upbound coal 30 cents. These figures are sufficient to demonstrate the entirely special character of the ore and coal business. On the other hand, the Canadian traffic was strictly commercial and competitive; therefore, for the purpose of any comparison which might fairly be made between freight rates by water and freight rates by rail, it will be proper to have regard more directly to the results established by the Canadian figures in 1912. It will help to a better understanding of the Canadian waterborne trade to give, a little further along, some hitherto unpublished facts with regard to the movement of wheat on the Great Lakes.

Before taking another step, we must pause to see precisely what the rate of .194 cent per ton per mile in 1912 means. If that rate is to be compared with the average rail rate on this continent, it must be made clear at once that another very important factor, which would swell the total, has been left out of the account. That factor is the government contribution to the inland waterborne business of Canada. This contribution is the interest on the capital cost of the artificial waterways placed at the disposal of ship owners, free of charge, and the annual maintenance of this right of way. The figures are readily available. The canals of Canada cost $103,400,589, and the annual interest charge on that capital sum, at 3½ per cent., would be $3,619,021. The cost of maintenance in 1912 was $1,725,738. The total of these two amounts is $5,344,759. By a simple calculation, it will be seen that this contribution by government was equal to 76.99 cents per ton on the whole Canadian freight tonnage of 1912, or .140 per ton per mile.

The account might be summed up in the following fashion:

	Per ton. Cents.	Per ton per mile. Cent.
Actual freight rate	91.04	.194
Government contribution	76.99	.140
Total	$1.6803	.334

How do the foregoing water rates compare with rail rates? Happily, we are not left to conjecture. The facts in relation to the transportation of wheat between Fort William, at the head of Lake Superior and Montreal, both by water and rail, are definitely known. The average rate on waterborne wheat between these points in 1912 was 5.774 cents per bushel, or $1.92 per ton. To this should be added the contribution by government of .140 cent per ton per mile, equal to $1.72 per ton, making the total $3.64 per ton. The rail rate of the Canadian Pacific Railway between Fort William and Montreal is uniformly $4 per ton, or .402 cent per ton per mile. The average rail rate of all the railways of the West on wheat is not higher. On a longer haul, say from Winnipeg to St. John, New Brunswick, it is even lower; so that the comparison is fair. Thus we have on this statement of facts a water rate of $3.64 per ton as compared with a rate of $4 per ton by rail. That comparison, however, is based on an average water rate on wheat of 5.774 cents per bushel. The maximum water rate for the season of 1912 between the same points was 8 cents per bushel, and at that rate the charges by water were 29 cents per ton higher than were the current charges by rail. A fair conclusion is that, on the whole, the water rate paid by the shipper is lower on certain commodities which are peculiarly suitable for transportation in steamers; but there is not a material difference between water and rail rates when all the facts and conditions are taken into account. The difference in favor of the water rate is created wholly by the fact that a considerable part of the actual cost of transportation by water is paid by the people at large.

It would take up a great deal more space than is at my disposal to give a complete analysis of the waterborne traffic of the Great Lakes in 1912, and to deal comprehensively with the exceptions to the rates just indicated which the inquiry revealed. Those exceptions would carry the water rate both far below the average given and also carry it considerably above. It could easily be demonstrated that as soon as the steamers undertook to transport other than highly specialized classes of commodities—package freight, for example—the charges were close up to the rail rate between the same points, and with the government contribution added were actually higher. While there is keen competition in the carrying trade on inland waters, there was a marked uniformity in the rates which prevailed between given points at the same period. There was, however, a wide variation in the rates at different seasons of the year. For instance, the average rate on wheat between Fort William and Buffalo was 2.719 cents per bushel in May; whereas in December it was 3.905. No such adjustability to the law of supply and demand can be made by the railways. The owners of vessels are not subject to the regulating control of either an Interstate Commerce Commission or a railway commission as are the owners of railways. The steamers may bid for traffic practically as they wish, and there is no limitation to their charges. Of course it is only just to say that 1912 was an exceptionally prosperous year for carriers by water. There have been years when they found it difficult to earn operating expenses, to say nothing about dividends, despite the higher rates imposed by railways.

There can be no question as to the propriety of adding the government contribution, to which allusion has been made, to the actual freight charges on waterborne traffic. If vessel owners had to pay interest on the capital cost of their right of way, and meet the annual operating expenses of that right of way, they would assuredly be compelled to raise their freight rates proportionately. The corresponding charges have to be met by the railways and are reflected in their freight rates. If the railways were exempt from these two calls upon their revenue, they could afford to carry freight at half the current rates and earn a higher net revenue than they now do. Such a statement is too obviously true to call for corroboration or the support of statistical data.

Ship owners, however, have insisted that in fairness the average freight rate charged by railways should also be swollen by the annual interest on the primary subventions given by government to railways. They hold that the cases are parallel in that regard. Let me say at once that my attitude in this matter is absolutely that of the statistician who has been asked to state the facts. It would be highly improper to introduce into the discussion any opinions of my own or to take sides. But frankness compels me to say that the parallel to which carriers by water have called attention is not apparent. If it exists, then no one can say what is the amount involved. Assuming, however, that government has given aid to the railways, without which the rail rates would necessarily be higher, let it be made clear immediately that the account has a countervail. The water rate has been increased to the extent only of the interest on the capital cost of canals and the annual maintenance of these canals. The vast sums expended on harbors, lighthouses, dredging and so on have not been taken into the reckoning, although they are directly connected with inland navigation and have been essential to the shipping trade. The only reason for the exclusion of these large contributions is that the exact amount cannot be ascertained. In other words, the water rate has not been charged with the great cost of terminals and their upkeep, nor the expenditure on other services which the steamer interests would have to provide if government had not already provided them. The aggregate of such outlays would more than offset the aid given by government to railways; so that the case of carriers by water, as regards the freight rate, has not been unfairly presented.

From the comparison which has here been made between water and rail freight rates in Canada, it may be assumed that the former are not lower than the latter when the public contribution is taken into account. Nevertheless, the people of Canada believe in canals and are about to spend fifty or sixty millions for the construction of a new and deeper canal between Lake Erie and Lake Ontario. It may be that this belief on their part is based upon unsound economic premises—for which they may readily be pardoned because of the absence of authentic statistics on the subject—but they are not likely to reverse their judgment when all the facts are clearly before them. Patriotism impels them to stimulate the use of their inland water heritage, which they hold in common with the people of the United States; but back of that is a negative reason which to them is quite as potential. They believe that the development and maintenance of waterways, free of all tolls to shippers, serves as an effective check on railway rates. It may be frankly admitted there is some truth in this assumption; but the open-minded student of transportation problems, with the statistics of waterborne and rail tonnage before him, will not be disposed to attach serious importance to such a view. He will see that the course of commerce is influenced by many other considerations than the immediate cost of moving freight from one point to another. That, however, opens up another field of discussion, having many and varied aspects, which would perhaps carry one away from the somewhat limited subject with which I have been endeavoring to deal in the light of hitherto unavailable facts.

The assumption that carriers by water are in active and constant competition with carriers by rail would seem to rest on a weak foundation. The outstanding phenomenon of the transportation situation on this continent is the relatively gentle rivalry between these interests. Theoretically, the moment the railway rates exceeded the water rates on any particular commodity the flow of traffic would be diverted to the steamers. Nothing of the kind happens, however. The railways appear to be able to charge considerably more per ton per mile than do the steamers without loss of business. But this rule works only one way.

It would also seem to be clear that the steamers can only be certain of cargo when their rates are clearly and substantially below the railway rates. Take the case of wheat coming down by water to Buffalo. At that point the Erie canal ought to pick up all the business it could handle—and, by the way, its capacity is distinctly limited—but it does not get more than a moiety of this export wheat. While the canal rate is, say, three cents a bushel to New York, the railways, charging from four to six cents, get an overwhelming proportion of the traffic. There must be strong reasons for such a condition. Obviously it is to be looked for in factors apart from the freight rate. If the transportation charges constituted the sole consideration it would be impracticable to have a rail rate of half a cent per ton per mile securing 75 per cent. of the traffic between points served also by water while the steamer rate was a quarter of a cent. Since that is precisely what happens every day during the season of navigation, the notion that anything like keen competition is taking place between these two carrying interests is not tenable.

A careful study of waterborne and rail traffic statistics over a period of years has convinced me of three things: First, that the waterways attract only certain bulky commodities as to the transportation of which time is not an important consideration; second, that carriers by water are compelled to quote considerably lower rates than the railways are actually charging in order to make certain of even that class of cargo; and third, that the quotation of these lower rates is only made possible by reason of the government contribution to which I have alluded. Hence it comes to pass that the steamers play an exceedingly useful part in the general scheme of transportation on this continent, handling in swelling volume a more or less specialized traffic, and leaving wholly to the railways the movement of a wide range of other commodities which, by a process of commercial gravitation, falls naturally into the freight car. That, at all events, is the situation as we now have it in North America.

It has been said that a few pertinent and novel facts would be given with respect to the movement of wheat on the Great Lakes. The volume of that movement has been steadily rising for years past. Wheat is peculiarly suitable for transportation by water. It seeks the cheapest outlet to market, although it does not always find it. The popular belief that a fraction of a cent will decide the particular channel which wheat will take is, of course, true when other things are equal. They are seldom equal. If 100,000 bushels of wheat are sold in Winnipeg for delivery in Liverpool by a certain date, the seller is compelled to choose that avenue which will enable him to carry out his contract. He probably has such a contingency in his mind when he fixes his selling price. Hence millions of bushels of export Canadian wheat find their way abroad every year via Buffalo and New York. This occurs even when the freight rate to Montreal is a cent or more per bushel lower—a situation which quite naturally perplexes and disappoints the Canadian people. The causes are to be found in the availability of ocean tonnage at New York, the Atlantic freight rate, and the lower marine insurance at American ports.

Last year 143,075,815 bushels of wheat came down by water from the American and Canadian West, of which 109,842,031 bushels were the product of Canada. A dozen years ago the situation was reversed. The Western States are not necessarily producing less wheat; but they are exporting less. In fact, the day would seem to be near at hand, as J. J. Hill predicted several years ago, when the United States will be importing wheat for domestic consumption. On the other hand, Canadian exports of this commodity are increasing somewhat rapidly, despite a rising home demand. This is due to the filling up of the prairie Provinces with producers. It would be gratifying, and at the

same time a defense of large capital outlay for the development of waterways, if the surplus farm products of the West on their way abroad clung to wholly Canadian channels. They do not, however. In 1912 precisely 50 per cent. of all the Canadian wheat carried by water took, partly or wholly, American avenues. Nearly 46 per cent. went out directly by way of Buffalo. The freight rates on this wheat averaged as follows:

Fort William to Buffalo:	
Per ton per mile	.103 cent
Per bushel	2.863 cents
Fort William to Georgian Bay:	
Per ton per mile	.163 cent
Per bushel	2.629 cents
Fort William to other Canadian ports:	
Per ton per mile	.115 cent
Per bushel	2.384 cents
Fort William to Montreal:	
Per ton per mile	.169 cent
Per bushel	5.774 cents

There is an aspect of this movement of Canadian wheat which is suggestive. In 1912 nearly 21,000,000 bushels were brought from Fort William to ports on Georgian Bay, whence it was carried by rail to Montreal for export, and to other points in Ontario for grinding. The larger bulk was exported. It was ascertained that the combined water and rail rates equaled the all-water rate to Montreal. The steamers got from 2 to 3 cents per bushel, and the railways from 5 to 6 cents, less handling charges. The steamer rate per ton per mile was slightly lower than the rail rate; but the steamers probably earned relatively more on their share of the haul than did the railways on a little longer haul. The point which calls for emphasis is not so much the approximate parity of the water and rail rate in this case as the disposition of large steamers to avoid artificial waterways. This is indicated by the steady increase of the trade to Georgian Bay ports. If that object lesson were lacking, it would still be true that vessel owners have a strong preference for deep water and sea room. Given a long haul in open water, and there is no question whatever that steamers can underbid the railways; but the moment canals or restricted channels intervene the freight rate goes up. And for a sound reason. Time is the controlling factor in the fixing of a freight rate by water rather than distance, and vessels make slow progress through canals and narrow channels. Interruptions and delays are common. The season of navigation on the Great Lakes does not average much over seven months, and during every moment of that time the operating expenses are constant, with the single exception of the quantity of coal being consumed. Hence the faster the vessel moves the larger is the tonnage actually transported, and in the end the net profits for the season will bear a more or less fixed relation to the volume of cargo handled.

ONE WAY OF KEEPING A STRIKE ALIVE.

An apparent effort to revive the defunct strike of the shop organizations on the Illinois Central, which was called in September, 1911, is indicated by a recent exchange of telegrams between Martin F. Ryan, general president of the Brotherhood of Railway Car Men, and officials of the St. Louis Southwestern.

On account of high water in the lower Ohio and Mississippi rivers the tracks of the Cotton Belt were used to detour trains of other roads between Jonesboro, Ark., and the bridge at Thebes, Ill. During the five days, April 6 to 10, a total of 310 trains of seven roads were handled over this single-track line, a distance of 140 miles. On April 8 Ryan sent the following telegram to T. E. Adams, superintendent of motive power of the Southwestern:

"Information has reached my office that Illinois Central trains and equipment are being detoured over the Cotton Belt on account of high water. You, no doubt, are familiar with the fact that all the shop organizations on the Illinois Central are now and have been on strike for several months. Please advise if it is the intention of the Cotton Belt management to require their car men to inspect and repair such Illinois Central equipment as may be detoured over Cotton Belt tracks. An early answer will be appreciated."

The threat manifestly implied in this message was met by President F. H. Britton in a reply to Mr. Ryan on April 10 as follows:

"Your telegram of the eighth, to Mr. Adams, inquiring if it is the intention of this company to require car men to inspect and repair such Illinois Central equipment as may be detoured over Cotton Belt tracks has been forwarded to me. The message indicates that you are familiar with conditions, and it is not necessary that I state that the damage done by flood waters to railroad and other property, including possible loss of life, through the lower Ohio and Mississippi, amounts to a public calamity and that we are detouring, in addition to Illinois Central business, trains of the Mobile & Ohio, Rock Island, Frisco and Iron Mountain, all of whose tracks have been more or less damaged by flood waters, and are thus performing a service of great importance to the public residing along and dependent upon the railroads mentioned for service, and who cannot be reached except through use of our rails. The work is one of public necessity, and we would be derelict in our obligations to humanity were we to decline to flood sufferers or those threatened with disaster the use of our facilities under existing conditions. Illinois Central equipment is, in a sense, our own while on our rails, the service rendered being provided for by reciprocal agreement granting us the use of their rails under similar conditions, and we shall continue to demand of our car men the same service in the matter of inspection and repairs, as with our own."

Mr. Ryan made no reply, but was quoted in the newspapers as saying he had no intention of interfering but had "merely asked for information."

The train movements between the points named during the five days, including those of the Cotton Belt as well as the roads detouring over its tracks, were as follows:

Date.		S. W.	I. M. & S.	C. & E. I.	Frisco.	I. C.	M. & O.	R. I.	Total.
4–6	North....	6	9	4	1	4	4	..	
	South....	6	8	3	3	6	4	..	58
4–7	North....	9	11	3	3	3	2	..	
	South....	8	8	5	2	3	7	..	64
4–8	North....	9	11	4	2	3	0	1	
	South....	10	9	4	3	6	1	1	64
4–9	North....	10	12	5	3	1	2	2	
	South....	9	6	4	4	2	0	2	62
4–10	North....	9	12	4	4	..	..	3	
	South....	10	9	4	4	..	..	3	62
	Total								310

Double-Tracking in India.—Two sections of the Bengal-Nagpur Railway, from Adra to the Jerriah Coalfield, and from Adra to Bankura, are being double-tracked at a cost of about $875,000. An interesting point in regard to traffic operation arises in connection with the doubling of the latter section. For some time congestion on the Adra-Midnapore section has been staved off with difficulty and the company has had the question of improvement under consideration. The present capacity of this section as a single line is 24 daily trains; after considering the probable developments of the early future the company has come to the conclusion that 32 daily trains must be provided for. The first idea was to double the section throughout; careful investigation has, however, shown that by doubling from Adra to Bankura—only one-third of the whole section—the capacity of the section as a whole can be increased to 38 trains. This seems at first sight a most extraordinary result. The explanation, however, would appear to be simple. Loaded trains start off from the coalfield during the night, empties are brought in during the night for loading during the next day. These two streams cross one another continuously for some distance from the coalfield, but at Bankura a point is reached where the downward traffic and the upward traffic are traveling at different hours, and the tendency to congestion is of course materially reduced. It thus comes about, as has been said, that by doubling but one-third of the whole section, its capacity is increased by over 50 per cent.

STEEL PASSENGER TRAIN CAR DESIGN.

Continuation of Account of the New York Meeting of the American Society of Mechanical Engineers Held April 8.

In our issue of April 11 abstracts were given of the papers presented by H. H. Vaughan on the "Introduction to the General Discussion," by C. D. Young on the "Painting of Steel Passenger Cars," and by John A. Pilcher on "Trucks for Passenger Cars." Abstracts of the other papers follow:

PROBLEMS OF STEEL PASSENGER CAR DESIGN.

By W. F. Kiesel, Jr.,

Assistant Mechanical Engineer, Pennsylvania Railroad.

The increasing cost of lumber, the desire for longer and stronger cars, and other considerations indicated the desirability of making a determined effort to develop a satisfactory steel passenger car. The object of this paper is to review a few of the problems encountered, beginning with:

Can we afford it, and what will it cost, compared with wooden cars? Tentative designs were prepared and carefully analyzed by a committee of representatives of car builders and railroads. The summary of its report was that at first steel passenger cars would cost approximately 20 per cent. more per passenger than wooden cars of the best existing types, but that the steel cars would probably cost much less to maintain. It also reported that on account of the increased cost of good lumber, and the probable decreasing cost of manufacturing steel cars, not many years would elapse before the cost of steel cars would be no more than, if as much as, wooden cars. At the present time steel cars cost no more than equivalent wood cars.

Shall the cars be all-steel, or steel frame with wood lining? Differences of opinion still exist on this point. Both types of car have been built, and each has strong advocates. In the all-steel car the steel lining may be securely riveted to the framing and adds somewhat to the strength of the complete structure, but as steel is a good conductor it carries away the heat of a body coming in contact with it, and, therefore, will always feel cold, even when the temperature in the car is sufficiently high. Satisfactory results have been realized from the use of a double steel lining between seats, forming a hot-air duct, extending from the heater pipes to the window sill, with outlet through small holes in the lining proper, located immediately below the window sill.

Wood lining requires considerable wood furring, and adds weight to the car without adding to the strength. As the steel frame of a long passenger car may vary as much as ½ in. between extremes of temperature, it is necessary to make allowance in the construction of the wood lining for this variation in length. As a car with metal lining riveted to the framing has the advantage in strength, weight, and cost, it will gain in favor; in fact, it would be at present universally preferred if all railway shops had practical experience with steel lining, and the necessary proficiency and machinery for its manufacture.

Insulation. Three general principles have been used for car insulation: Wood lining; by placing insulating material on the outside of steel lining; by placing insulating material on the outside of the steel lining, and on the inside of the steel sheathing. Experiments have been made also with other methods, such as completely filling the space between sheathing and lining with block magnesia and magnesia cement. The problem that presents itself is: Given a car body with a comparatively smooth exterior surface protected by several coats of paint, double walls, painted on both sides—if of steel—isolated air spaces rather large in volume between the walls, an inside cubic volume in which the air must be continually renewed, and a window surface of about one-third the area of the side walls. When single windows are used the air close to the windows is cold in winter, and warm in summer. Double windows improve the situation materially.

Experiments made to determine the difference between a wooden and a steel coach, with doors and windows closed, standing on a siding exposed to the sun in hot, summer weather, showed a difference of one to two degrees in favor of the wooden coach. One day's readings showed an average of one degree difference in temperature in favor of the steel coach, which had insulation only on the outside of the lining. The results of several years' experience indicate that the lining must be insulated throughout, and, if the spaces between lining and sheathing are properly isolated, little is gained by insulating the sheathing, and more will be gained by the use of double windows. Furthermore, the heat lost in cold weather by conduction through and radiation from the walls, in cars with insulation on the lining alone, is negligible when compared with the heat carried off by adequate ventilation.

Protection and safety of passengers. This problem involves providing adequate strength for carrying the load, also to prevent collapse or crushing in wrecks, and efficient brakes. The laws governing load-carrying strength are well known, but this cannot be said of the laws governing wrecks. Each wreck forms a separate study, and we seldom find two that can be placed in the same class. The study of wrecks, which, unfortunately, do occur, shows that the car underframe must be reasonably strong to resist end strains, that the ends of the superstructure must be reinforced with strong vertical members, and that the car must not collapse when rolled down an embankment. The gradual elimination of crossings at grade has materially decreased the danger of stresses directed against the sides of the car.

Early experience with steel freight cars showed clearly that the men handling cars in yards believed that all cars built of steel could withstand much rougher handling than wooden cars. Although the resultant damage to both kinds of freight cars had its disadvantages, it developed a better knowledge of the relative value of steel and wood in car construction, led the designer to abandon the basis of ultimate strength of the material, and to substitute the basis of elastic limit, and finally to select a ratio of 4 to 1 as the relation of the elastic limit of steel as used in cars to that of good timber. That not all designers of steel passenger cars had the advantage of this knowledge, or profited by this experience, is evidenced by some of the car designs which have been illustrated in the technical papers in the past years and which proved fundamentally defective.

Selecting from the last generation of wooden cars one used in heavy trunk line service, with four 5-in. by 9-in. wooden sills bunched together near the center, and so located as to be nearly uniformly affected by the end strains, steel platforms with draft gear securely attached, and the remainder of the car to correspond, the analysis of its end-shock resisting capacity leads to the consideration of the elasticity of the material, the transverse bracing preventing buckling, the concentration of strength near the longitudinal center line of the car, and the reinforcement at the platforms. The wooden car, therefore, meets many of the requirements enumerated before. A corresponding steel car should have a center sill area of 45 sq. in. braced against buckling, a strong and efficient draft gear as a substitute for the elasticity of the wood, and a ratio of 0.04 for stress to end force, the calculations to include consideration of lever arm of force below the neutral axis of the center sills. For lighter service a steel car with a center sill area of 32 sq. in. and a ratio of 0.05 for stress to end force may be considered as a substitute for a wooden car with four 4-in. by 8-in. sills bunched near the center of the car. The use of steel permits a distribution of material to better advantage than is possible with wood. The box girder center construction is continually gain-

ing in popularity; the strong vertical members at car ends, to prevent one car overriding and penetrating the superstructure of another car, are now considered a necessity; and a superstructure, including a roof sufficiently strong to bear the car when turned upside down without collapsing, is very desirable.

Trucks. The impression that cars with six-wheel trucks necessarily have better riding qualities than those with four-wheel trucks has proved to be incorrect. The substitution of four-wheel trucks for six-wheel trucks saves about 18,000 lbs. per car. Increased journal bearing surface obtained by an increase of diameter of journal only is of little or no benefit in preventing hot boxes, because the periphery velocity increases in the ratio of the diameters. The weight per journal should not exceed 1,500 lbs. per in. length. A long spring base, low-lying center plate, and anchoring the dead levers to the car body instead of to the truck frame promote smooth action and easy riding at all times. The equalizing springs should, therefore, be placed as near the journal boxes as possible, or directly over the boxes, and the bolster springs should be on or near the center line of the truck sides. If the dead levers of the truck brake are anchored to the car body, the truck frames have no tendency to tip up when the brakes are applied, and the jarring effect is entirely eliminated. A special axle with 5½-in. by 11-in. journal for passenger cars would be of material benefit, would permit using four-wheel trucks under all coaches and 60-ft. baggage cars, and longer cars with six-wheel trucks would have sufficient margin for the excessive loads sometimes encountered and the danger of hot boxes would be avoided.

ROOF STRUCTURE FOR STEEL CARS.

By C. A. Seley,

Mechanical Engineer, Rock Island Lines.

The advent of the steel car has rather encouraged the use of the oval or round roof, as it is often called, particularly for cars used for baggage, express, and postal purposes. It is cheaper to build and maintain and fulfills requirements for such cars. For passenger cars the clear-story type prevails very generally, as it assists in lighting and ventilation and in decorative effect. The shape of the carlines of either type of roof should be such as to facilitate the fastening of the roof and of the inner ceiling or finish, and between these there should be a generous amount of insulating material to intercept the heat of summer and the cold of winter.

The specification for full postal car construction, which was approved by the Postoffice Department in March, 1912, contains the following paragraphs in regard to the roofs of such cars and is probably as authoritative a statement as there is available. The strength of roofs of some cars that have been rolled over in accidents has been checked against the formula used, and it has been found ample to afford support against serious roof distortion in such cases.

"*General.*—The roof may be of either the clear-story or turtle-back type, depending on the standard contour of the railroad for whose service the cars are built. In the clear-story type, the deck plates shall be in the form of a continuous plate girder, extending from upper-deck eaves to deck sill, and either built up of pressed or rolled shapes, or pressed in one piece from steel plates. The carlines may be either rolled or pressed steel shapes, extending in one length across the car from side plate to side plate, or may extend only across the upper deck. In the latter case the lower deck carlines may be formed by cantilever extensions of the side posts or by independent members of pressed or rolled shapes. In the turtle-back type, the carlines may be of either pressed or rolled shapes, extending in one length across the car between side plate and side plate, or may consist of cantilever extensions of the posts.

"*Carlines.*—The projected area of the portion of roof in square feet, supported by carlines, divided by the sum of the section moduli of the carlines, must not be more than 100.

"*Roof Sheets.*—Roof sheets, if of steel or iron, shall be of a minimum thickness of 0.05 in., and either riveted or welded at their edges."

The design of the roof is also subject to the general paragraphs on stresses and details of the postal car specification. There are several bills in Congress having in view the substitution of steel passenger equipment on railroads for present wooden cars. Should any of these become law, specifications for construction will be necessary, and, as the postal car specification has been approved and adopted as standard by the government, no doubt it will be used as a basis in determining the requirements for other steel passenger equipment cars, not only for the roofs, but for the other features of construction.

SUSPENSION OF STEEL CARS.

By E. W. Summers,

President, Summers Steel Car Company.

Unfortunately the roadways we have to contend with cannot be made or maintained in true alinement. Frost and water make constant changes in the track support. Lateral curvature requires super-elevation of the outer rail. In passing from a tangent to a curve, or vice versa, the tracks under one truck are not in the same horizontal plane with those under the other one. Steel car bodies of the enclosed type, such as box cars, mail, baggage, or passenger coaches, are of rigid construction and have high torsional resistance. A three-legged stool on an irregular floor surface will stand upon all of its legs while one having four legs may carry all of its load upon two diagonal supports.

The use of truck springs helps the illusion that we are distributing the car body load on all of the wheels. The uneven deflection of the springs indicates directly the increased load of one spring over the other. When the track surface is warped more than the total spring travel, the whole load is carried at two diagonal corners, tending to twist the car body. This twisting tendency is constantly changing, first in one direction and then in the other, as the super-elevated rail changes from one side of the track to the other. The effect upon wooden passenger cars is to work the joints loose and cause them to screech and grind like the spokes of a wooden wagon wheel in hot dry weather.

The side bearings of steel sleeping cars pop like sledge hammer blows when the car is taking or leaving a curve. The slight twist in the track surface throwing excessive load upon two diagonal corners of the car causes the bearings to grip and adhere to each other coincident with the slewing of the truck. When the twisting of the truck exceeds the play in the parts around the truck bolster the side bearings let loose and jump with the resulting hammer blows. More efficient roller side bearings may prevent the gripping and jumping, but the uneven load is still present. The twisting effect upon the car body is not removed. Failure in roofs of wooden box cars and the resulting damage to merchandise in transit is due to this constant twist. Roof designers have attempted to remedy this by making the roof flexible and with slip joints. To be consistent they should go further and make the whole car of India rubber. A practical construction for the enclosed type of steel car bodies must and always will be rigid and of high torsional resistance.

The necessity for flexibility between the car body and the trucks, and for an even distribution of the load upon all of the wheels seems not to be fully appreciated as yet, but with each succeeding year wrecks due to broken rails, wheels and truck structure will drive this home. Suspension of steel cars, as has been developed by the writer in the past three years, does permit of a more even distribution of the load upon the wheels than with center-bearing trucks.

[Mr. Summers then explained at length the construction and operation of the balanced side bearing truck, which he has developed. *Railway Age Gazette* readers are more or less familiar with it; a description appeared in the issue of March 22, 1912, in connection with an article on the all-steel box cars for the Bessemer & Lake Erie. It has also been referred to frequently in the controversy on locomotive tender derailments which has been carried on in the columns of the *Railway Age Gazette* during the past six months.]

STEEL INTERIOR FINISH.

By Felix Koch,

Assistant Mechanical Engineer, Pressed Steel Car Company.

The use of a small amount of wood in the interior finish, as for instance, window sash moldings, seat arm rests, window capping, etc., should not be objectionable as it has certain advan-

tages over steel which are desirable; wood is used for such details to a considerable extent, and hundreds of cars are now in service in which the small amount of wood used in the interior finish cannot be detected except by an expert and such cars are to all intents and purposes fireproof cars, but the aim of many designers has been to eliminate the wood wherever possible on account of the many advantages possessed by steel, among which may be mentioned:

(*a*) Steel finish means non-combustion in case of fire.

(*b*) Steel prevents splintering in case of wreck.

(*c*) Steel finish may be easily removed should it become necessary to repaint the car on the inside surface of the steel sheets, as the life of the steel car, to a certain extent, depends on the condition of the paint.

(*d*) Steel finish makes it possible to increase the interior width of the car where outside width is limited. This has been found particularly valuable in designing subway, elevated or suburban steel passenger equipment cars.

(*e*) Steel finish will avoid trouble which may be experienced due to different expansion of materials—steel as compared to wood. This point need not be considered with steel and makes it unnecessary to provide for relief in all members of the finish running longitudinally, such as upper and lower deck sill moldings, etc. In fact, the steel finish has revolutionized to some degree the designs of wood finish in the wooden cars built since steel cars came into vogue. The cars of today are built on more sanitary lines, and fancy moldings, fretwork and carvings have disappeared without losing sight of giving the cars an artistic finish, avoiding thereby lodging and breeding places for all kinds of germs and filth.

(*f*) Steel finish will, by comparison, be cheaper every year for the reason that it becomes more difficult to obtain the right kind of lumber for interior finish, which, of course, means increase in price of wooden cars.

(*g*) It is continuously becoming more difficult to obtain men who have had sufficient experience in applying wood interior finish, whereas it does not take the same experienced men for applying steel finish. A man requires from three to four years' apprenticeship to become an expert in applying wood finish to a car, whereas an average intelligent man who is familiar with tools is able to become an expert in finishing cars with steel finish in from six to twelve months.

(*h*) A more uniform color may be maintained on steel finish than on wood, which comes in different shades, and it is very difficult and expensive to match perfectly all parts in one car with regard to shade without additional expense of glazing. Furthermore, the average life of paint applied to steel finish will be much greater than to wood finish for the reason that wood darkens with age. This, of course, influences the paint which is a disadvantage from the standpoint of illumination. Should it become necessary to repaint a car of wood finish, reworking of the finish by removal of the varnish and scraping is necessary, whereas in the steel finish the scraping is eliminated and the removing of varnish is alone required to be able to repaint the car.

(*i*) Steel finish is of advantage from a building standpoint in the handling and working up of material. Steel details may be worked up to a large extent before they are applied to the cars, which makes it possible to manufacture the interior finish in much less time by the use of more men, than it is possible to employ when applying a wood finish, as only a limited number of men have room to work at the same time in a car when the greater part of the fitting and cutting, etc., has to be done. This has facilitated the establishment of a number of manufacturing concerns who devote their efforts almost exclusively to producing steel interior finishes not only for passenger cars but also for buildings. In addition to these any manufacturing company equipped with the necessary machinery for the making of drawn moldings, breaker presses, and ordinary welding and spot welding machines, is able to handle this class of work for railroads or car builders, who may not have the necessary equipment to do the work in their own shops and prefer to buy the interior finish as they buy other specialties.

All of these advantages are almost exclusively confined to the use of steel or other metals, although a composite material of a wood pulp nature or similar material made fireproof and waterproof by different processes, if applied in a proper way and used for ceilings and below the window sills, is not objectionable, and may be applied in practically the same manner as steel. The advantages possessed by wood over metal as a non-conductor may be very much reduced by the use of proper insulating material correctly applied. The use of proper insulation is, of course, of great importance; manufacturers of that class of material as well as railroads and car builders are giving a great deal of attention to the subject, and the time does not seem to be far distant when steel cars with interior finish of wood will be as scarce as steel passenger cars were ten years ago.

ELECTRIC LIGHTING OF STEEL PASSENGER CARS.

By H. A. Currie,
Assistant Electrical Engineer, N. Y. C. & H. R.

From a standpoint of practical consideration for the welfare of passengers, the lighting plays one of the most important parts; therefore, every effort should be made to arrange the light units so that no discomfort be occasioned, and to install the apparatus and wiring so that operating failures be reduced to a minimum.

The two essential considerations for the designing engineer to keep in mind in laying out his installation are: (*a*) The arrangement of parts in a manner to allow of easy inspection and repair. (*b*) Protection against mechanical injury. Convenience and accessibility of apparatus, fixtures, junction boxes and wiring mean much to the inspector. It is well known that the average inspector will pay little attention to those parts which are difficult of access, and much better inspection work will result where parts are arranged in a get-at-able manner. It is of equal importance that the various parts be protected in such a manner as to avoid all possibility of injury to them while the car is in service.

Axle Generator. It would be a consummation much to be desired if truck designers would provide a generator support built integral with the truck; the requirements are not difficult and it is certain that the generator builders would be glad to make their machines conform to the truck builder's suspension. As the matter is now handled, nothing causes them more delay and inconvenience than obtaining information about the numerous details of truck and underframe construction necessary for making an intelligent layout of the generator suspension.

ELECTRICAL EQUIPMENT ON STEEL MOTOR CARS.

By F. W. Butt,
Assistant Engineer, Electrical Department, N. Y. C. & H. R.

In providing for the electrical equipment on steel motor cars, several important points should be considered. On account of its metallic construction, the car becomes a negative conductor, or, in other words, the car is grounded, and all electrical apparatus must be well insulated against leakage of the electrical current. Switches, circuit breakers, fuses, etc., should be so located that the arc when opening a circuit will not reach the metal structure of the car. In cases where space is limited, and it becomes necessary to locate circuit breaking apparatus in such a way that there is danger of the arc reaching the metal structure, suitable arc shields of non-conducting and non-inflammable material should be used.

In the design of new cars it is sometimes found convenient to locate various members of the structure, especially in the underframe, so that the apparatus may be suspended from them without the use of intermediate supports. This is desirable, as it is often found that many parts may be omitted from the car.

The steel car is safer than cars of wood construction, as there is no danger of bad fires on account of short circuits. Parts of the structure of a steel car will not become alive, as is sometimes found in cars of wood construction.

AIR BRAKES FOR HEAVY STEEL PASSENGER CARS.

By A. L. Humphrey,
Vice-Pres. and Gen. Man., Westinghouse Air Brake Company.

The improvements made in air brakes in recent years, which have made it possible to control the present heavy high-speed passenger trains with approximately the same degree of efficiency as the older forms controlled the equipment of their day, have been based on scientific principles and experience in obtaining reliable information and data. The matter of time of transmission of compressed air was not so important a factor with the shorter trains and slower speeds as it is today, where a train running at 80 miles per hour passes over a distance of 117 ft. per sec.; consequently a few seconds' saving in the time of getting the brakes fully to apply is just so much relative gain in the time and length of stop. With the latest improved pneumatic equipment, the maximum brake cylinder pressure can be obtained throughout a modern train of ten cars in 4 seconds, which is the shortest possible time that this can be obtained by serial quick action through a train of this length. For the purpose of shortening this time serious consideration is being given by some railroad officers to the type of brake equipment used on the New York subway, and known as the "electro-pneumatic," which would not only tend to cut the time of full application in two, but by means of the electric control all brakes are applied simultaneously, which not only assists in shortening the stop but in preventing shocks, etc.

Another equally important factor now coming more prominently into use is the application of brake shoes to each side of the wheel, known as clasp brakes. The virtue of clasp brakes, however, is not so much in the aid they afford in shortening the stop as in the equalizing effects of pressure on the wheels, journal box bearings and trucks, the minimizing of lost motion which affects the brakes through increased piston travel, and the less tendency toward wheel sliding while the brakes are applied.

THE USE OF CAST STEEL.

By C. T. Westlake,
Chief Mech. Engr., Commonwealth Steel Company.

Cast steel as applied to underframes and end frames of railroad cars is the result of careful design, and painstaking and thorough development of the art of casting in sand molds. These large steel castings are made in baked molds, confined in massive metal forms, by a special method that assures positively against swelling due to pressure of the inflowing metal, and yet permits yielding to the pressure of the contracting metal when cooling, so that the castings are very accurate in shape and close to size, and are free from shrinkage stresses.

As recently as 1893, cast steel was comparatively unknown in car construction, and in that year its introduction began in the use of truck bolsters for freight cars. This was followed a few years later by body bolsters or transoms, and it was only after their use on freight cars had demonstrated satisfactorily the reliability of the material and design, that attention was turned to passenger cars. The double body bolster was first to receive consideration for passenger cars, and although, due to casting difficulties, its weight was at first excessive, it was quickly refined and assigned to its proper place with other cast-steel articles. It was found to be so much lighter, stronger and permanently effective than the built-up type, by forming a one-piece cradle or support for each end of the car body, that its use soon became almost universal in construction of passenger cars.

As one of the most valuable properties of cast steel is its adaptability to combine a multiplicity of complex parts into a single one of simple form, it was gradually developed from the double body bolster form, first to include end sills, then end and buffing sills; next the end and buffing sills were combined with longitudinal members extending to, and connecting with the double body bolster. Finally these parts, together with many others, were combined into a single simple member at each end of the car underframe, and comprising so many of the fixed parts that it is now only necessary for the car builder to connect them by center girders and to apply draft and buffing gears and the superstructure to complete the car frame.

The ideal underframe should have all connecting members in the same plane so as to avoid buckling due to eccentric loading; it should be so designed that each member will independently perform its individual functions, passing the stresses from one member to the other through the smallest number of properly alined connections; and all should be so arranged in relation to each other as to form one powerful, compact, shock-absorbing element throughout the length of the car. This may be accomplished to great advantage in cast-steel construction since the metal may be properly distributed in proportion to the stresses. The gusset plates may be placed in the same plane as the flanges of intersecting members, and the whole reduced to minimum weight and to the smallest number of parts with practically no joints. It may be molded to any desired conformation, may be shaped to any curve, useful or ornate, without the use of expensive dies, and may be provided with necessary projections joined to the main members by proper fillets. Openings may be provided with finished and reinforced edges, and all parts may be molded to symmetrical, pleasing contour, all edges rounded and a complete, practical, operative device, emanating from a single source furnished to the car builders ready for application.

As the rounding of curves necessitates the use of convex ends to the car body, the central portion of the ends is most exposed and liable to receive initial impacts, and this portion should be made strongest and most capable of properly transmitting the force of impacts to the balance of the frame. The underframe receives the force of end collision as a column load on its longitudinal members, while the end frame receives it as a transverse load on exposed members supported at their ends. As it is impracticable under these conditions to make the end frame equally as strong as the underframe, provision should be made for protecting the end frame against destructive forces. The underframe should be arranged so as to receive the initial impact, and if the encountered force is sufficient to destroy it, it should fail in such manner as to form additional protection to the end frame. This is accomplished in cast-steel construction by arranging the parts of the longitudinal members so that when loaded to destruction by a collision force, the end portions yield upwardly, thus folding the exposed portion of the platform up against the end of the car body, and forming an addition to the end frame to assist in distributing the force to all the longitudinal members of the superstructure. The advantage of this construction has been demonstrated in wrecks when this action has taken place, the safety of passengers being assured, and the property loss kept low.

The cast-steel platform as now provided for blind end cars, comprises the buffing sill having recesses for the buffer foot plates, holes and brackets for the buffer stems, pockets for the buffing device, brackets for safety chains, lugs for draft gear, brackets for drawbar carry irons, anti-telescoping plate, extensions of the center sills and bottom chords of the side sills, all of the double body bolster members including side bearing arches and extending for a distance of over 14 ft. inward from the end of the car to a point considerably back of the truck center, and counting rivets, gusset plates and connecting angles, combining more than 1,000 pieces into a single, powerful, shock-absorbing element of less weight than fabricated material of the same strength.

The cast-steel platform and double body bolster for vestibule cars comprises all the parts enumerated for blind end cars, and in addition, includes the exposed platform longitudinal members, step risers and end sill, measures over 17 ft. in length, is made of a single piece, and is also of less weight than fabricated material of the same strength.

Since the government has taken a hand in the construction of cars used in its service, stronger body end frames are being used, and as the end of the car is the first to encounter end collision forces, it reasonably deserves closer and more careful con-

sideration. Most damage is produced by end collisions and to protect life and property from them, the colliding object must be prevented from entering the car. To accomplish this, the end frame and end portion of the underframe should be constructed so as to distribute the force of collision into all the longitudinal members of the car, passing it into the largest mass, utilizing every particle of available inertia to absorb the force without permitting it to reach and act upon the contents or occupants of cars. The end frame proper should be designed so that when a single member is loaded, all will act with it, and this can be accomplished only by connecting them so as to form a single mass, and best by forming them in a single piece as in cast-steel construction.

In designing the cast-steel end frame we assume it to be a beam supported at its upper and lower ends and loaded at a point about 18 in. above its lower end. We provide connections between the end frame and balance of car frame of sufficient value to develop the full transverse strength of the end frame; the vertical members of the end frame are connected by horizontal members so that in case the end frame is loaded to destruction the connections are sufficient to disrupt all the longitudinal members of the car frame, and when they yield all parts will be forced toward the center of the end of the car and tend to prevent one car telescoping the other.

Cast-steel parts weigh less than built-up members carrying the same load since the metal in castings may be properly distributed in proportion to stresses. In built-up construction the metal overlaps at the joints and this, together with the rivet heads, makes an additional weight which in cast construction is avoided. In the latter, reliance is placed in a single solid member and, as there are no joints, there is no chance of their being imperfect or becoming loose.

The advantage in cast steel to the car builder is also very great. To produce a platform of the built-up type at least eight different classes of material are required. This comes from eight different manufacturers, frequently from as many different points of production, much of it in less than carload lots, and all has to be requisitioned, purchased, received, stored and recorded for use on each particular lot; and in order to reduce storage space and avoid congestion in the car plant, all deliveries have to be carefully and accurately timed, and followed up. Then each material has to be passed through the different departments of the car plant to be cut, shaped, punched, drilled and the same timing and tracing methods used, so as to have all parts completed at the proper time. When cast steel is used but one material is purchased from a single plant, only one piece is handled, that in carload lots, and when it arrives it is immediately ready and available for application without storage or re-handling, facilitating completion of the car by leaving more car plant machinery available for other work.

UNDERFRAMES FOR STEEL PASSENGER CARS.

By J. McE. Ames,

American Car & Foundry Company.

This paper will be confined to underframes of steel passenger cars for through service, or those at least 70 feet long. The natural division of such designs is: (*a*) Underframes designed to carry equally on all sills. (*b*) Underframes designed to carry on center sills only. (*c*) Underframes designed to carry on sides only. (*d*) Underframes designed to carry on sides and center sills.

Each of these types has its partisans and each type is in successful operation today. The first is the type used abroad almost universally and at home for repairs under wooden cars, the bodies of which are too good to destroy but need better underframing. In general the deep side sill has been discarded because of the difficulty of inspection beneath the car. The deep center sill is much in vogue at present because it looks strong, but on a car with deep center sills inspection must be made of the parts attached to the underframe from one side of the car at a time, and the introduction of axle light equipment becomes difficult on account of the interference with the deep sills. Again, to sustain its own weight without deflection on a 60 ft. span, too much weight of metal is required to make such a sill economical.

Of the second type, that is, with the whole weight to be carried on the center sills, a common form has center sills of two special 18-in. channels with ½-in. cover plates top and bottom, all sections extending the full length of the car in one piece. The box girder so formed has a square inch section of 50, and the superstructure load is transferred to these sills by means of four cross bearers, two of which take the place of the body end sills in other designs. There are no side sills as such, the angles simply forming the attachment for the superstructure. The parts are usually assembled with the bottom of the sills upward and allowed to deflect. The girder is then reversed and the camber straightens out by the weight of the metal. The sills are the same depth and section throughout their entire length; with this construction a truck of special design must be used, the center plate of which must be nearer the rail than usual. The weight of the body rests upon the side bearings as well as the center plate. The service given by this underframe has been excellent.

The third type, with all the weight carried by the car sides, has the center sills used only for buffing and pulling. An example which may be referred to has two I-beams running the full length of the car in one piece, with a square inch sectional area of 23. They are held up by the three cross bearers which pass under and are attached to them. There are no side sills, the carrying members being the sides of the car. These members are composed of ⅛-in. plates, about 36 in. deep, stiffened vertically by the window posts and having a 6-in. by 6-in. by ⅝-in. angle at the bottom and an equal square inch section of metal at the belt rail, the two girders having a square inch section of 48 in all. With this construction a substantial body bolster is essential, as the weight must be carried at the bolster extremities. Usually a cast-steel structure, built into the underframe and securely riveted to it, is used, as the weight of the metal may thus be economically distributed. With an underframe of this type there is no trouble due to difficulty of inspection or interference with attachment for axle light or other equipment under the car.

The fourth type is a combination of types *b* and *c*. Here deep center sills are used, having a square inch section of, say, 40 at the center and 39 in cast steel at the draw gear. The side girders have a square inch section of 21 in the two. Most underframes of this type now in service are built with cast-steel and in portions which include in one casting the body bolster, platform, side and center sills extending as far back of the bolster as may be necessary to secure a substantial connection to the center sills proper.

While several of these types have been in service for a number of years the required time has not passed in which to develop structural defects due to unseen causes, such as fatigue of metal, crystallization, etc. If such defects exist they should make themselves known during the next three or four years, if freight construction is any criterion. We know fairly well the behavior of these types under unusual service conditions due to wrecks.

SPECIAL ENDS FOR STEEL PASSENGER CARS.

By H. M. Estabrook,

President, Barney & Smith Car Company.

Notwithstanding the frantic efforts of Congress toward the general adoption of steel passenger cars, it has been stated upon reliable authority that no vestibuled wooden passenger car, in the construction of which was employed the anti-telescoping end framing, in a straight-on end to end collision (although frequently having the ends concaved) has ever had the end crushed in to the extent of the adjoining car body telescoping and entering it.

It is, of course, apparent that the weight of the steel car is much greater than a car of the same size of wooden construction,

and that the wooden car possesses in itself a natural elasticity to absorb buffing shocks such as are produced by collision that the steel car does not furnish. Hence, in the development of the steel car, with the enormous increase in weight of trains and the high speed at which they run, there has been a growing tendency to increase the strength of the structure with the view of making it as nearly indestructible as possible in order to compensate for the absence of elasticity. It is also apparent that, notwithstanding the strength of the structure, if it encountered an opposing force of sufficient magnitude, it might be annihilated, and so this strengthening process and the increasing weight and speed might go on indefinitely without furnishing the result sought for. It is equally true that if the structure is designed for such strength as to be indestructible, when the two opposing forces meet, the movable objects within the cars, which is the human load, must suffer the damage. To avoid this possibility the idea has been evolved to construct that portion of the end of the car between the end of the main body and the vestibule face plates, these members being all such parts as are embraced in the platform, vestibule and hood covering the vestibule, so that it will collapse under a less shock than would be required to crush in the end of the car body itself.

This idea is based on the theory that in a train in which there are, say, ten vestibuled cars, there is the space between the main bodies of each two coupled cars occupied by the platforms and vestibules of approximately 8 ft., or in a ten-car train a space of approximately 80 ft., of shock absorbing space, which, if properly utilized in the instant of collision, would remove to a large degree the shock and resultant damage to the car body itself and likewise lessen the possibility of damage to the persons of the passengers. From this idea has developed what is termed a collapsible vestibule. It is generally conceded that if two vestibuled cars coupled together could maintain their respective horizontal planes at the instant of shock due to collision, there could be no telescoping and that telescoping is due to one car assuming, at the instant of collision, a higher or lower horizontal plane than its adjoining neighbor, causing one to ride the other with the resultant telescoping effects.

It is generally conceded, that in cases of two cars tending to telescope, the point of maximum shock is never over 20 in. above the floor line. In the government postal car specifications, this point has been definitely fixed at 18 in. above the floor line, and with this in view the end posts are reinforced for a distance of about 4 ft. above the floor line by steel angles riveted to the Z-bar end posts.

This collapsible vestibule was described in the *Railway Age Gazette* of January 24, 1913, page 142. In its construction the longitudinal sills and floor members are designed to stop at the end sill of the car body proper, the end of which is sheathed with a heavy steel plate extending in one piece vertically from the roof downward to the bottom of the end sill. If the shock of collision is not entirely absorbed by the vestibule members before the end of the car body proper can be crushed, this plate will tend to pull the roof downward and cause the direction of the oncoming car to deflect obliquely upwards instead of the two cars telescoping. Further to offset the effect, should the two cars change their horizontal planes in collision, pressed steel shapes in the nature of anti-climbers are placed below the buffer beam and platform.

The platform, vestibule and hood members are designed with a view to withstanding all shocks incident to regular service, but in abnormal shocks, such as would result from collision, the rivets connecting the various members would shear off with the exertion of less energy than would be required to crush the end of the car body, thereby causing the vestibule to collapse, absorbing the shock and furnishing a cushion between the two car bodies proper. It is assumed that in case of a collision these would be the only parts seriously damaged, and the car could be repaired and replaced in service with a minimum of expense and delay. The entire collapsible vestibule, comprising the platform, vestibule and hood, is constructed as a unit, detachable and separate from the car body proper and can be applied after the car is built or in the alteration of cars already built and is equally applicable to cars of either steel or wood construction.

The object of the collapsible vestibule is, first, to protect the lives of the passengers and secondly to protect the body proper of the car from serious damage.

THE INTERSTATE COMMERCE COMMISSION.*

By James C. Jeffery.

In 1860, the population of the United States was roughly speaking, 30,000,000, and this population was served by 30,000 miles of railroad. At the close of the Civil War, that great region west of the Mississippi river was as yet untouched, and it was therefore, natural that the railway and financial pioneers of those days should turn their eyes to this virgin territory. In 1869, the first transcontinental line was completed, and by 1871, there were 60,000 miles of road in operation, which by 1888, had increased to 150,000 miles, and was serving a population of 60,000,000. In short, from 1860, to the time of the passage of the first Interstate Commerce Act, in 1887, the population of the United States had doubled, while the railroad mileage had increased fivefold.

The consuming population as well as the producing population of the United States was confined very largely to the regions lying east of the Mississippi, and north and south of the Ohio. These great rivers, with their tributaries, and with the coastwise lines of the Atlantic seaboard, afforded up to this time, almost a sufficient means of transportation to take care of the rapidly growing demands of the country, so that with this large increase in railroad mileage, the carriers by rail were compelled not only to meet the rates of their newly constructed competitors, but also to meet the rates of the long established water carriers, which may be said to have then been at the height of their efficiency. This sudden and enormous expansion in railroad mileage naturally carried with it disastrous effects. The railroad traffic men of the day sought tonnage rather than revenue, with the result that always comes from chasing this elusive rainbow, that is, receiverships. It is needless to say that this competition amongst the carriers was acute to a degree that we of today can scarcely appreciate. A published rate was almost unknown. One shipper had no idea what his competitor was paying, nor did a carrier have any idea what rate its competitor was making. Even rebates were unnecessary, and to put it mildly, the situation was intolerable. The public demanded a remedy, which was presented by Senator Edmunds, in the form of the act to regulate commerce, which was, after going through the various Senate and House committees, approved and passed February 4, 1887. The act was merely a statutory embodiment of what has always been the common law, but which common law had up to this time been rarely enforced, that is, that it is the duty of the common carrier to serve the public by charging not more than a reasonable rate; but furnishing equal service to all, without discrimination; and by giving to the public, adequate facilities. Today, the Interstate Commerce Act, with its various amendments and supplements, seeks but to do these three things.

The act of 1887 failed to accomplish these purposes for the reason that although the five members of the then Interstate Commerce Commission were capable and zealous, yet the inherent weakness was that the congressional act creating it, failed to give the tribunal sufficient power to cure the evils contemplated. Various amendments were made of relatively small importance, until 1906—but in that year the Interstate Commerce Commission was truly vitalized, and in a simple way. Up to 1906, the commission was compelled to go to

*Abstract of an address at the annual banquet of the Transportation Club of Detroit, on February 8, 1913.

court to enforce its own orders: after 1906, a carrier was compelled to go to court, if the orders of the commission were not to be enforced. And at this time, too, the number of the commissioners was increased from 5 to 7. There were numerous changes, and amendments, other than the one referred to, but there can be little doubt that this shifting of the burden of going to court was the revolutionary one. The Mann-Elkins amendment of 1910 made another fundamental change in giving to the commission the right to suspend any new tariff or rate promulgated by the carriers, and the commission under this amendment claims the right to suspend even a reduction in rate, where it thinks such reduction would work a discrimination.

The cumulative effects of the original Interstate Commerce Act, the amendments of 1906 and 1910, together with the United States Supreme Court decisions construing the act, have vested a vaster power in this judico-legislative tribunal of seven men than is known elsewhere in the civilized globe.

While it may be too soon as yet to judge what the ultimate effect of the concentration of this vast power in the hands of these few men will be, still there are certain results that everyone must admit have been gained; a greater stability of rates, which in itself makes the means of transportation more useful, more economical to the shipper; the substitution of a natural and legal competition between the carriers themselves, for an unnatural and illegal competition, and last and perhaps greatest, gentlemen, it has inculcated in the minds of all of us, whether shipper or carrier, a greater respect for the laws on the federal statute books.

The question today has ceased to be, "Will you have an Interstate Commerce Commission of greater or less power?" but is, on the other hand, "Will you have an all powerful commission, or will you have a government ownership of your public utilities, engaged in interstate commerce?" And the day you decide upon government ownership, you have sown the wind from which you shall reap the whirlwind—you have sown the seeds of destruction of our republican form of government, though, the end may be one or three centuries away. Let me paint you a picture. Some future demagogic president of the United States, drunk with ambition to succeed himself; a political machine composed of 3,000,000 to 5,000,000 government-owned railroad employees; the support of capitalistic interests that would come with the disposition in the hands of such a president, of $5,000,000,000 annual income of these railroads. With these tools your demagogic president would become dictator over an empire vaster than Caesar in his proudest moment ever dreamed of.

Industrial traffic men and railroad traffic men have educated this Interstate Commerce Commission to a degree where it is no longer satisfied with the glittering generalities of 20 years ago; where you may no longer speak to it in general terms of economic demands, water competition, and cost of construction. You have educated it to the stage where you must get down to detail; where you must show an actual direct discrimination if you allege it; where you must demonstrate real reasons for your contentions and not endeavor to shroud your position in a mysterious veil of facts and figures that fool neither yourselves, your opponents, nor the tribunal to whom they are presented.

I ask you to pray with me, that the future Interstate Commerce Commissions of the United States may be constituted of the same capable, fearless, incorruptible types of our American manhood that compose it today. The commercial prosperity of the nation depends in no small degree upon this.

New Undertaking of the German Railway Union.—The German Railway Union has appropriated $7,140 for the preparation and publication of a history of locomotive construction, and has engaged a well known Austrian engineer, Dr. Sanzin, to prepare it. It is to be completed within four years.

THE MANAGERS' AND FIREMEN'S BRIEFS.

Final briefs were submitted on Friday, April 11, to the arbitration committee, which has been hearing the firemen's demand for higher wages. The brief of the firemen laid special emphasis on the request for uniformity of wages and conditions on the 52 eastern roads, which are parties to the arbitration proceedings. The firemen point out that in the present arbitration, the board has been unable to determine what has been the increase in wages even on any one railroad, and claim that if for nothing else uniform conditions and wages should be put in force, so that in a future proceeding, similar to the present one, a basis of comparison will be available. Uniformity in rates and rules are necessary and desirable in other industries as evidenced by the peace, contentment and profit that prevail in the mining industry, where uniform rates and rules are in effect, as compared with the instability of prices, discriminations and abuse, and the continuous unrest of employees where uniformity does not prevail. The firemen's brief goes on to say that the industrial advantages of uniform wages and conditions are proven in the printing and building trades, in contrast with the steel and textile trades where ignorance and misery are the standards of labor as shown by the reports on the Lawrence strike.

"Uniformity of rates is the privilege of the railroads, a privilege guaranteed the railroads by federal legislation . . . and by the regulations promulgated by the Interstate Commerce Commission, requiring of one railroad only that which is required of all, thus placing all on an equality under the law.

"Uniformity in rates and rules should not be influenced by the relative wealth of railroads, because in no other trade or industry does the wealth of the employer fix the wage of the employee. The difference in the bank accounts of an employing printer or builder in no way influences the wage of the journeyman printer, the carpenter or brick-layer. The less prosperous railroads profit as greatly by the labors of the locomotive fireman or hostler as do the wealthiest railroad corporations. The productive efficiency of the locomotive firemen is as great on one railroad as another where the same class and weight of locomotive is used, and the financial returns to a less prosperous railroad from a fireman's labor on the same class of locomotive, is sometimes greater than to the more prosperous railroads, because of higher local freight rates." The brief explains that the firemen are not asking for standardization of wages, but are practically asking for a species of piece-work wage, where the fireman is paid more or less in accordance with what he earns for the railroad company. A lower rate is asked for on locomotives where the fireman produces less profit for the railroad.

THE MANAGERS' BRIEF.

The brief for the railroads was submitted by Elisha Lee, chairman of the committee of managers:

In the original demands made upon the railroads the firemen asked that any increase in wages or changes in working conditions secured in this movement be made effective as of July 1, 1912. In answer to this, the chairman of the railroads' committee says that section IV of the Erdman act provides that the award, having been filed in the clerk's office of the circuit court, shall go into effect at the expiration of ten days from such filing.

Both the firemen and the railroads are on record as desiring to invoke all of the provisions of the Erdman act, and to submit themselves unreservedly to its treatment. The railroads now claim that the impossibility of making the award retroactive is determined by the law.

The railroads have taken strong exception to the demands of the firemen that "rates of wages that are higher and conditions of employment that are better than those asked for in the present movement shall remain in effect."

"There can be no justice in retaining 'high spots' unless the board also allows the 'low spots' to remain.

"As long as these conditions exist the labor organizations will continue to formulate extravagant and unwarranted demands,

knowing full well that to them there can be no loss, but on the contrary the chances of gaining something more without jeopardizing any advantage already enjoyed, is an incentive for renewed and continued efforts for adjustments in rates and working conditions."

Mr. Lee then points out that a comparison of the amount of work performed by firemen in 1902 and 1912, and the amount of wages paid to firemen in those years, shows that a fireman's pay has increased in that period more than the amount of his work. The roads also contend that nothing has taken place since the adjustment of pay in 1910 (which was satisfactory to the firemen) to necessitate any further increase, or the establishment of a minimum day's pay for this territory.

In answer to the demand of the firemen that a second man be placed on all engines in through freight service weighing 200,000 pounds or over on the drivers, Mr. Lee says that "the weight on drivers is not a governing factor in itself of the work required of firemen." He claims that the question of giving assistance to the firemen can only be properly disposed of by a study of all facts and conditions surrounding the work of the firemen. He says that great improvements to the engines—which are now being rapidly added to the larger locomotives—are reducing the fuel handled by a fireman to a marked extent, and thus the necessity for either a second fireman or further assistance is diminishing rather than increasing.

More attention is devoted to the demand of the fireman that two men be placed on certain locomotives than any of the other articles under arbitration. The railroads still contend—the following was strongly opposed by the firemen in the open hearings before the arbitration commission—that where conditions warrant giving assistance to the fireman it is proper to use the extra brakeman required by the so-called "Full Crew" laws. Mr. Lee says the Pennsylvania Railroad is doing this now. This extra brakeman, he says, has been forced upon the railroads and as he usually rides in the engine, with no work to do, the railroads have a perfect right to have him assist the fireman or perform any other work that may be necessary to successful operation.

In general, the railroads hold that, owing to the many conditions affecting the work of the firemen, each run or set of runs on the several roads, and divisions of those roads, should be treated independently in considering the question of assistance for firemen.

The firemen, in their original demands asked for standardization of wages and working conditions in the Eastern District, but excepted from this demand for standardization, higher rates of pay and better working conditions than those asked for. The railroads claim that standardization is not only wrong, but in some instances absolutely unjust, because: It fails to recognize dissimilar physical characteristics on different parts of the same road. It fails to consider the varied traffic conditions represented by volume of business on different roads or parts of the same road. It fails to recognize the differences in wages paid labor in other employments in different localities embraced within the limits of the district covered by the lines involved. It fails to recognize that a wage scale should at least bear some relation to the ability of the road to pay, as may be reflected in the earnings, which factor more or less reflects the character of the service required of the employee. Standardization is inconsistent with Article 9 of the Firemen's Demands, to the effect that existing rates of compensation that are higher and better working conditions shall not be disturbed.

As proof of this, Mr. Lee quotes President Carter of the firemen's organization, who said:

"I will confess that on some roads it is not as hard to fire as on other roads, because of the character of the track and the character of the machinery."

In concluding the brief says that "to grant the firemen their demand for annual increases in pay of 35.5 per cent. would have a strong and well-nigh irresistible influence toward bringing about large collateral increases in other classes of railroad employees." In this connection attention is called to the recent history of wage demands in the eastern territory.

"Early in the year 1910 the conductors and trainmen made certain demands for increased wages, which were finally disposed of by granting adjustments covering a large part of the territory, either through mediation, arbitration, mutual understandings, or a general advance. Later, the firemen received like adjustments, and still later the engineers' wages were also adjusted.

"In the early summer of 1912 the engineers again made further demands, which were finally arbitrated, when they were granted certain increases throughout the territory. Now the firemen are here again, and the conductors and trainmen have already made further demands, and are now urging the railroads for prompt action. How long such demands, which up to the present time always have resulted in additional burdens on the finances of the railroads, can continue without impairing the credit of the railroads depends very largely on the decision in the case of the firemen."

GREATER EFFICIENCY IN SAFETY WORK.

By George Bradshaw.*

Much has been deserved and much said in praise of the "Safety First Movement." In principle the movement is sound and it has passed the experimental stage. In fact, so much intrinsic merit does it possess that, though it has been tested only in a loose and imperfect manner, most favorable results have been obtained. On some roads the personal injury record has been reduced 10, 20, 30 and even 40 per cent. For this, railroad officers and employees are entitled to much credit; but they will not be entitled to the greatest commendation till they have succeeded in preventing the very highest percentage of accidents that can reasonably be prevented—and 40 per cent. is not the highest. We must not be content with half a loaf.

The favorable results obtained under present methods which, I repeat, are loose and imperfect, are due in no small degree to the interest that always attaches to a new proposition. That interest, in the case of "Safety First," has extended to enthusiasm because of the high and noble sentiments to which the work of accident prevention appeals. But the time will come, perhaps is now appearing, when the novelty of the thing will wear off. It will then be a routine matter of operation and we shall have to depend for results upon correct principles and efficient methods of organization.

I believe it is entirely practicable to reduce the personal injury record 75 per cent. How? By simply applying and carrying out the safety first idea to its logical extent. Do not get the impression that I am about to launch into a description of some gloriously ideal state. Enthusiastic as we may become in our efforts to prevent injuries, we must always bear in mind that we "have got to run the road" and that safety must be wedged in with efficiency of operation. It cannot be allowed to crowd it out.

A DEPARTMENT OF SAFETY.

There should be created on every road having any considerable mileage, a safety department, in charge of a man specially qualified for the work, who should have the title, pay and authority of vice-president, and be responsible only to the president. Considered either from an economic or a humane standpoint, there is no position more entitled to such confidence and reward. Safety is not and will not really be first until some president makes it so by placing the work of accident prevention upon the high plane its importance justifies. "Safety First" was started at the bottom, and its full force has not yet reached the top. The president who first in truth and in fact really establishes safety first on his line will become known both as a benefactor and a breaker of records in reducing operating expenses.

*Safety Engineer, Railroad and Industrial Corporations, Highland, N. Y.

Complaint is made—and justly made—against drastic legislation, some of which—as for instance, the recent full crew acts—is little short of an outrage. But is not this about the logic of the situation? The record shows a high percentage of accidents which, from an operating standpoint, it is reasonable and practicable to prevent. That much must be admitted; and the fact that we have prevented a fair ratio of accidents cannot be pleaded as a justification for not preventing all that should reasonably be prevented. Rather do the results obtained serve to turn the spot light on the greater results possible to obtain. One thing is certain; preventable accidents must be prevented. Public opinion—the court of last resort—has entered this decree. Are they going to be prevented as the result of legislation or by the voluntary effort of railroad officers? One or the other. Legislators, generally speaking, are making an honest effort to solve the problem. The trouble is they don't know how to solve it. Railroad officers know how to solve it, but they are not doing it. Some, it is true, have made an excellent beginning, but none have gone far enough and some of the largest systems, in spite of all the demonstrated merit of the safety first campaign, have done practically nothing. The public is apt to classify all the roads with those which are conspicuous by what they have not done.

The vice-president in charge of safety should have authority over all departments in matters pertaining to safety. It may perhaps be objected that this would interfere with departmental affairs; but let us face the situation squarely. Departmental affairs need interfering with to such reasonable extent as may be necessary to prevent preventable injuries; because it is these same "departmental affairs" that are responsible for the record of one employee injured every four minutes and one killed every two hours and forty minutes from one end of the year to the other, not to mention passengers, trespassers and others. Besides, these affairs are being most seriously interfered with, right now, and that by a class of men who do not know what they are doing, but who are no less determined to do something—our friends, the legislators. Would it not be better to have them interfered with by one of our own number who understands the problem?

But such organization would not interfere to any undesirable extent in matters affecting output or efficiency of operation. Note the qualifying clause: *in matters pertaining to safety.* These are mostly details and for that reason are overlooked by the heads of departments, who are kept too busy with problems of efficiency to give serious and prolonged attention to matters relating solely to safety. For example, 40 to 50 per cent. of the injuries received by shop employees are eye injuries caused by flying sparks, dust, metal chips, etc. That record has been going on for years. No superintendent of motive power ever did anything to prevent, or perhaps ever gave a serious thought to any systematic means of preventing this class of injuries until a "safety man" found that they could be almost entirely prevented by the simple means of wearing proper goggles. Now, the wearing of goggles is solely a matter of safety, separate and apart from efficiency, and all such matters should be decided directly and finally by the officer in charge of the safety department.

The trouble at present with the safety first campaign is that it is wholly an easy-going scheme of co-operation. But co-operation is not a universal virtue. Even if every one were disposed to co-operate, much valuable time and energy are wasted in enlightening and convincing every member of the compact to the co-operating point. One man—the right kind of man—should be given authority and held responsible for the prevention of injuries. Of course, this power in the hands of the wrong kind of man might cause trouble, but the same is true of power vested in the head of any department.

Of course, the general manager is supposed to see accident reports and to apply preventive measures. But, as a rule, he never sees reports of other than the most serious cases. The daily grind of accident reports which make the big total at the end of the year and which present the serious problem for consideration in any systematic plan for accident prevention, he never sees except through the seasoned judgment of a fifteen-dollar-a-week clerk. True, such reports are referred by the clerk to the heads of the various departments. That is just where they should not be referred, because the head of a department where an accident occurs is responsible, actually or technically, for the accident in the first place, and we should not expect him to sit in judgment on his own cause and give a fair trial. Even if this were not true, the limit placed upon him in incurring expense is an insurmountable obstacle to his efforts. If the superintendent of motive power has to be everlastingly pleading for appropriations sufficient to keep engines in running condition, he is not going to borrow trouble by asking for funds to construct safeguards. If the chief engineer is allowed barely enough help to keep the track in such condition that the cars will stay between the engine and caboose, it is safe to say that his forces will not be worked overtime cleaning up yards of rubbish or in removing dangerous side and overhead obstructions. They simply do what any one would do under the circumstances—"keep in the clear" from the man above and take chances of accidents occurring. I am now referring, not to collisions, wrecks and derailments, but to the ordinary every-day accident occurring here, there and yonder every hour of the day and night.

THE CENTRAL OR GENERAL SAFETY COMMITTEE.

The division and shop safety committees, composed of officers and employees, afford a most practicable means of conducting safety work, but, in my opinion, the committee idea should not be carried beyond divisions and shops. The central or general safety committee is a cumbersome and ill fitting wheel in the safety machine and should be taken out. Such committee has no authority and no responsibility. Every subject for its consideration must be handled in one of two ways. It must be referred to the member to whose department it relates and his opinion concurred in by the other members, in which case there is no advantage in having a committee decision, or it must be decided by vote of the various members, each guided by his own judgment, which results in the head of one department, as a member of the committee, determining action upon matters within another department. The principle is wrong whichever way you apply it. Of course, such a committee generates a certain amount of interest in accident prevention and fosters a spirit of co-operation. It serves to keep alive—sometimes barely alive—on the altar the sacred fire of safety. But this article relates to *greater efficiency* in safety work.

THE NEED.

The need is for a practical and easy working method of getting results. The greatest obstacle in the promotion of safety has always been departmental restrictions, and the central safety committee simply adds another obstacle. From its very nature, it is a machine of deliberation and delay. What is needed is action. The problem is not complicated. Let me illustrate. The roof of a roundhouse becomes weakened and is in need of braces and supports to keep it from falling. The foreman reports the condition to the master mechanic, he to the division superintendent, who directs the division engineer to give the matter the necessary attention. The latter investigates and reports that the cost of repairs will require special authority. The ball of red tape is then unwound till it reaches headquarters, 500 or 1,000 miles away, where it is strung in, out and around two or three offices, and in six months it gets back to that particular roundhouse, provided the tape doesn't get broken and the ends lost. This was an actual case; and what really happened was that the roof fell in and injured two men while departmental routine was being observed to the extent necessary to get the carpenters at work. I do not contend that the roundhouse foreman should have arranged directly for the repairs (except in a case of great emergency), but if there had been on that road a vice-president in charge of safety to whom the roundhouse foreman could have reported the condition by wire, that officer would have directed the head of the proper department to make the repairs at once, and they would have been made. Two personal injuries would

not have occurred and it *would not have cost any more* to make the actual repairs through this channel than to make them by the more circuitous route.

From the standpoint of efficient work in preventing accidents, the trouble with existing methods is this: The men who have authority to "do things" are too far from the scene of action, and have too many other and more pressing duties. The men who are "on the ground" are not vested with authority, and when it comes to getting authority (for safety purposes) there are too many references, too much circumlocution and too many obstacles.

The "Safety First Movement" is a beacon light leading to the haven of safety. But its rays come to us over a broad expanse of troubled waters beneath whose surface there are rocks and shoals to be avoided. While we are on a good ship it must be remembered that she will not steer herself.

PICKED UP ON THE ROAD.

By Gulf.

Certainly the superintendent who tries to get his trains over the road on time is up against it hard when he encounters the indifference of his men. Where discipline is lax or impossible to maintain, the men dawdle in their work and the maintenance of the schedule is out of the question. To point the statement I was on a local the other day that was scheduled at 26½ miles an hour, with stops every 3 miles. It carried express matter for small villages averaging eight or ten packages for each stop. Yet on that schedule the train lost 18 minutes in 45 miles, simply because of the long station delays. The expressmen handled their freight with the deliberation of government employees. They gossiped and used up the seconds faster than the enginemen could make them up. They knew that the train was late, delayed by them and by others of their kind and by other trains in the opposite direction that had probably been held up in the same way. A little hustle, a little springing to the work, a little interest in the reputation of their road, would have kept that train on time over the whole run, and saved a corresponding amount of despatcher work. But how to get that hustle, that springing, that interest; ah, that is the question that involves the effort that must be constant, personal and unremitting.

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Does it just happen so, or is it the rule? I mean about library and observation cars. Why does it happen that they are not only the worst riding cars on the train, but that their riding qualities are so decidedly bad that one can only read in them at the sacrifice of comfort and eyesight. It would seem that of all cars, especial care should be taken to have these ride easily and without the jar that is warranted to ruin the best of eyesights in the briefest of times. Again, I would like to ask, is it the location on the train that produces the effect? Is it the weight of the car? Has it just happened so with me, or is it just pure carelessness on the part of the builders or designers?

* * * * *

I know of a road that has a line that ought to be a heavy travel route, between large centers of industry, but it isn't. Its cars are well equipped and comfortable, barring the parcel rack which lacks just an inch of being what it ought to be. The reason why it is not a great route is due probably to the fact that its time table and train performances do not agree. There are other competitive routes, so I never travel that way if I can avoid it. That there must be thousands of others like me, there is no doubt, for I can count personal acquaintances by the score that feel and act as I do. I recently made a hundred and fifty mile trip, in spite of myself, and shared with two others a new, freshly carpeted, gas lighted car. Our combined fares would hardly have paid for the light, heat and lubrication, to say nothing of the power, to haul the car. Now the foolishness of this, as it seems to me, lies in the ostrich-like hiding of the head, and thinking that it pays to publish a fast schedule that cannot be run. If the managers of that road would be honest with themselves, and simply open out their schedule, and make it what they can run by, the added income would more than pay for the balm for their dethroned pride in their fast traffic that exists only on paper.

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I have taken occasion from time to time to comment on the insufficiency of many of the parcel racks in coaches and have suggested that the long rack introduced many years ago on the New Haven about filled the bill for convenience and comfort. But it never occurred to me that it was necessary to read a lecture on the necessity of making it strong enough to carry its load. It seems, however, that such is the case. I traveled in a car the other day in which the racks were all right in appearance, but no one was allowed to put a dress suit case in them lest they break down. There were thirteen other passengers and the rack contained six hats, a lady's jacket and a small parcel; while on the floor jammed in between the chairs and the windows, were ten dress suit cases. The question is, if you are going to have a rack why not make it strong enough to do its work? There are also some cars with racks not only too weak to hold the dress suit case, but with no hook for the coat. This latter inconvenience can be remedied by carrying an ordinary picture hook, such as goes over mouldings, and catching one hook in the grid of the bottom of the rack, while the other will serve to take the loop in the collar of the coat.

Coat Hanger.

AXLE LIGHTING EQUIPMENT.

A new axle lighting outfit involving a number of radical departures has been developed by the Electric Storage Battery Company, of Philadelphia, Pa. The dynamo is of the Rosenberg type which has been extensively used abroad, modified, however, to give constant voltage characteristic rather than constant current. The field excitation is controlled by a Wheatstone bridge combination of circuits without any moving parts or contacts. The inherent characteristic of the Rosenberg type of machine, which gives the same polarity for either direction of rotation, eliminates the necessity for any pole changer. The variation in voltage is reduced to narrow limits and no lamp regulator is required. The system adjusts itself automatically to different conditions of load produced by variations of schedule or by change of season, so that no manual adjustment is required to meet these different service conditions. At the same time useless overcharge of the battery is eliminated, establishing conditions favorable to long battery life. The Atchison, Topeka & Santa Fe, after a test of this system, has ordered 62 sets. The equipment which was tested has now made over 60,000 miles without a failure.

Maintenance of Way Section.

THE word "efficiency" has been much misused and made to cover many theories within the past two or three years. Nevertheless it expresses a condition toward which all enterprising and ambitious railway officers are striving. In the bridge, building and water service departments, excellent opportunities are afforded for those in charge to make very favorable showings. The labor employed is of a higher standard than in other branches of the maintenance department, the work is scattered over a wider area, and the variety of duties is greater. All of these conditions afford apportunity for the economical handling of forces and the development of special methods. The routine repair and renewal of bridges under traffic introduces one type of problems, while the construction of a new bridge presents others of a somewhat different nature. The building or repair of station or yard buildings gives rise to still another class of problems. The installation and maintenance of water stations is a smaller but nevertheless important field, where efficient methods are to be found to as great an extent as in any other department. These indicate a few of the numerous fields covered in the next contest on "Efficient Methods in the Bridge, Building and Water Service Departments," which closes April 25. Contributions describing the organization, distribution and management of regular and extra gangs, special methods or kinks developed in the construction or repair of any structures, and, in fact, any means tending to promote efficiency in these departments will come within the limits of the contest, including, as it does, all work ordinarily coming under any of these departments. Special attention will be given by the judges to data regarding the actual results secured by the means described, so that all information of this nature should be included. Prizes of $25 and $15 will be paid for the two best contributions, while our space rates will be paid for all others accepted and published. All contributions should be sent to the Civil Engineering Editor of the *Railway Age Gazette,* Transportation Building, Chicago, and must be received before April 25 to be considered in the award.

THE lack of definite information regarding the service obtained from the various materials and tools used in maintenance work is often a serious handicap when ordering additional supplies. On many roads little attempt is made to collect such data unless it refers to some new device which is being tried out experimentally. Much of the material used today is to a large degree standard, and is made by a number of firms. In such instances the quality and the price are the two things to be considered. Where the quality is the same, the price will, of course, determine where the purchase shall be made, but very frequently the materials vary in quality, and then comparative data regarding service is of much assistance in deciding intelligently which material is the most economical to purchase. Generally this data is not available, and as a result the material which is cheapest in first cost often is bought, even though it may be more expensive in the end, because the officer doing the buying knows that he cannot intelligently defend the purchase of the higher priced product even though he may be convinced in his own mind that it is the cheaper. It is for this reason that the manufacturers so often complain that little but first cost is considered by railways. The supervisor to whom the materials are furnished takes little interest in their relative service. He, or his superiors, may watch the results in a general way and draw their own conclusions, which may, or may not, be shown to be correct when analyzed with the actual data. Service statistics can be readily collected if the higher officers make it a point to gather this information and impress its value upon their subordinates. The collection of such data need not extend over the entire system, but if several of the more progressive supervisors are selected who will watch the results fairly and with interest, the sum of their observations will be fairly close to the truth. With such data at hand the officer specifying the material, whether he be the engineer maintenance of way or the purchasing agent, can select it to better advantage and know that he is getting the best for the money.

THE building of a hump yard with a capacity of 6,000 cars and provision for increasing this to 12,000, is an indication of the favor with which this type of yard construction is looked upon by the Canadian Pacific. The operation of hump yards is not an experiment on this road, as one has been in service for a number of years in the city of Winnipeg and a smaller yard in Fort William was rebuilt for classification by gravity in 1911. While hump yards in this country have been almost confined to a few large companies, of which the Pennsylvania Railroad is notable, in recent years numerous smaller yards have been built, such as the Centralia yard of the Illinois Central, the Mannheim yard of the Chicago, Milwaukee & St. Paul, the Silver Grove yard of the Chesapeake & Ohio, and the Louisville yard of the Kentucky & Indiana Terminal. The question of the relative economy of hump yards and flat yards is by no means finally settled in favor of the former, however, as is shown by the recent construction of the Proviso yard of the Chicago & North Western as a flat yard having a capacity of 6,000 cars. The construction of the Clearing yard near Chicago for interchange between roads entering from the east, south and west, has apparently been justified by the decision to operate this yard and the work which has been started on its reconstruction and enlargement (see *Railway Age Gazette* of March 21, 1913). This yard is unusual not only because it will be, so far as is known, the largest hump yard in existence, having a capacity of 12,000 cars, but also because of the number of tracks over the hump. Even the largest hump yards have been built heretofore with a single track over the hump, but at Clearing four tracks are operated over the single hump, two in each direction. The two yards at Winnipeg are probably the most northerly hump yards in service, making the conditions for the successful operation of this type of construction particularly adverse. From the hump grades adopted, however, the weather in this locality during the winter months apparently has little more effect on the operation than that in our northern states. The accelerating grade on the hump in the old yard at Winnipeg was 3.7 per cent. for a horizontal distance of 300 feet. This grade has been increased since the construction of the yard and the operating department still reports that under some conditions it is not steep enough. The grade adopted for the new yard is 4 per cent. for a horizontal distance of 75 ft.

THE importance of the careful classification and distribution of second hand rail in the economical prosecution of maintenance work is not always realized. It too frequently happens, as pointed out elsewhere in this issue, that the higher officers confine their attention to the manufacture and inspection of the rail up to the time it is received, and then leave it to the care of subordinate officers. While the careful study of the manufacture of rail is vitally important and worthy of all the attention given it, the possibilities for economy or confusion in the handling of relaying rail would seem to justify the careful supervision of some person having jurisdiction over the entire system. The uniform classification of rail released from main tracks is essential so that an officer making a requisition for rail of a certain grade for a definite purpose may know that he will receive rail suited to his needs. On some roads where the classification of released rail is left to the individual roadmasters there are al-

most as many different standards of classification as there are roadmasters. Under such conditions rail may be shipped to work which is entirely unfit for the purpose desired, resulting in delay and expense, or the material may be better than actually required, and if used deprive some other work of the material. Equally important with the uniform classification of material is the careful arrangement of a schedule of relaying operations so that the work may proceed smoothly from main line to secondary line and then to branch line, without delay either to men or material. Obviously, rail cannot be laid on branch lines until it is released from main lines, and any delay in laying new rail on the main lines will affect the operations of the entire season. Likewise, if rail is not used promptly after release, the work on the branch lines will be carried unnecessarily late into the fall, thereby delaying ballasting and other operations on these lines. The proper time to remove rail from the main line to secure its greatest total service is another point to be considered. On most roads with a large proportion of branch line mileage it is not advisable to allow rail to remain in the main line until it is unfit for further service. Indeed, not infrequently the demands for rail for branch line use govern relaying operations on the main line. Closely allied with the handling of rail is the gradual elimination of odd sections. Most roads in this country have absorbed at one time or another numerous small roads, and in this way have come into possession of a varied assortment of rail sections. Obviously, these sections must be continued in use until the material is ready for the scrap pile. While all new material is bought to the prevailing standards of the system fastenings, switches, etc., must still be kept in stock for all the various sections as long as they are used. While the difficulties incident to this condition can be minimized by confining the various odd patterns to certain divisions, they can only gradually be entirely eliminated. Thus, while the entire subject is largely one of details, these details are important, and if proper attention is given to them important economies can be effected.

THE VALUE OF A PROGRAM OF WORK.

THERE is no branch of the railway service in which the value of a systematic program of work is greater than in the maintenance of way department. While the duties in many other departments are largely the same from month to month, in the maintenance department, from its very nature, certain work can be done to the best advantage at certain definite times of the year, and if it is not done, not only is it not done as well as it could be, but the schedule of all following work is deranged.

The year's work in the maintenance department really begins with the opening of spring, and therefore spring should be the starting point of a schedule or program. While realizing the value of such a program in the abstract, many supervisors and other officers in direct charge of maintenance fail to definitely apply the principle of it to their own duties. On nearly all roads the budget of expenditures has now been decided on and the local officers know the amount of work they will be called upon to do during the year. If a schedule is arranged immediately upon receipt of the budget, material can at once be ordered to be delivered at the various places on definite dates determined on in such a way that the forces can proceed from one piece of work to another with the minimum delay. By keeping his program clearly before him, the supervisor can transfer his forces from place to place with little loss of time in moving.

One disadvantage of not providing a supervisor with statements of the cost of his work from day to day is that he does not then realize the amount of the unproductive time for which the company pays and therefore does not realize the importance of keeping this to a minimum. An advantage of a systematic program of work which is intangible but nevertheless important, is its effect upon the foreman and men. Nothing tends to break the interest of a foreman in his work more than to be transferred back and forth at the will of the supervisor to the detriment of his efficiency. The efficient supervisor will not only arrange the general details of the work for his foremen to the best advantage, but will encourage the individual foreman to do the same thing within his gang. The average section or extra gang suffers a great deal of lost motion which can be converted into productive effort under the proper supervision. The poorer the class of labor employed, the greater becomes the necessity of guarding against such lost motion. By outlining his work with the foreman the supervisor can encourage him to feel his responsibility.

Another phase of the subject which promises to become very important this year is the necessity of securing the most from the labor, for the supply bids fair to be considerably below the demand. In former years when labor was more plentiful it was possible for a road to neglect its work in the early part of the season and make up for the delay by putting on larger forces later. The experience of last year indicates that in future work left undone in the spring will either remain undone or will interfere with other work. As important as a definite program has been in the past, it is becoming a necessity under present conditions. A supervisor can ill afford to allow the time of his men to be consumed unproductively when he probably will not have enough of them in any event to do all that is necessary.

THE LESSONS OF THE RECENT FLOODS.

THE floods of the past three weeks in Indiana, Ohio and neighboring states have commanded the attention of the people of the entire country, but their significance to the railways in the territory affected has not been realized by the public. The immediate effect has been to make it necessary to concentrate all the resources of these roads in the way of construction materials, equipment and labor, in the flooded districts to restore the tracks as rapidly as possible. The second effect has been to place a very heavy financial burden on the railways in question, the loss to them in property only in the state of Ohio alone being estimated, after a careful inspection, at $10,000,000.

The promptness with which the railways have met the emergency is best evidenced by the fact that in spite of the great damage done the main lines were in most cases reopened for service within a few days and nearly all tracks were reopened within two weeks. This has required the prompt assembling of thousands of men from a wide area, the gathering of hundreds of car loads of piling and other bridge timber, stone and other filling material, etc., and the collection of many pile drivers, derricks and other equipment with their crews. The mobilization of these forces, which were brought together hurriedly, without any warning or preparation, into a working organization, has called for a high degree of ability and efficiency. Nor is the experience of the past few weeks exceptional, for other emergencies have been dealt with as skilfully by the railways. Our readers are familiar with the situation that developed in southern California a few years ago when, after all other resources had failed, the Southern Pacific successfully took charge of the problem of returning the Colorado river to its proper channel after it had flowed for some time into the Imperial valley and threatened the destruction of the entire valley. A more recent instance of the same nature is that of the closing of the crevasse in the levee at Beulah, Miss., within the past few weeks. After unsuccessfully attempting to return the flood waters to their proper channel, the government called for the assistance of the Illinois Central. This road placed its construction equipment and men at the service of the government with the result that this crevasse now bids fair to be permanently closed.

Obviously the financial loss suffered by the railways in such disasters must be made good from their earnings. Within recent years the tendency has been to greatly curtail earnings and, as a result, when such unusual conditions develop, the money intended for improvements must be diverted and used to tide over the emergencies. President Willard of the Baltimore & Ohio is

quoted as saying that it will be necessary to use a very large part of all the funds intended for betterment work on that system this year in the reconstruction of its damaged lines. The loss suffered by the roads is not confined to the actual damage to their property, but an even larger loss results from their inability to handle traffic while their tracks are out of service, and also from the decreased business, originating within the flooded territory for several months. In considering how much railways should be allowed to earn the public and public authorities are apt to overlook emergencies such as these which come at irregular intervals, but which must nevertheless be provided against.

The ultimate effect of such a policy of regulation as is now being followed is to force the weaker roads into the hands of receivers when such disasters occur. Several receiverships during 1912, for example, were in a large measure brought about by the severe weather of the winter of 1911-12. It is to be hoped that the heavy damages incurred by the roads in the recent floods will impress upon those having to do with the regulation of railways the necessity of allowing the roads to earn enough to enable them to accumulate funds to tide them over emergencies, which always have come, and which always will come.

NEW BOOKS.

Proceedings of the American Railway Bridge & Building Association. Paper bound, 6 in. x 9 in., 330 pages. Published by the American Railway Bridge & Building Association, 226 W. Jackson Boulevard, Chicago. Price, $1.

This volume contains the proceedings of the twenty-second annual convention of this important railway organization, held at Baltimore, Md., October 15-17, 1912. It contains the reports of eight committees on the following subjects: Fire resisting paint; derricks and other appliances for handling material in supply yards; concrete tanks; stand pipes and reservoirs; reinforced concrete culvert pipe; the construction and maintenance of long pipe lines for water supply, intakes, pump pits, reservoirs, etc.; turntables; painting of structural iron or steel for both bridges and buildings, and relative merits of brick and concrete in railway buildings and platforms. The discussions of the various reports appear in full with the reports. The reports included in these proceedings are among the most valuable ever presented before the association, those on concrete tanks, reinforced concrete culvert pipe and turntables being especially good. The report on turntables is one of the most complete discussions of this subject which have been prepared, and there has been a wide demand for it in advance of the publication of the proceedings. Dealing with subjects of particular importance to the railway officer having in charge the supervision of bridges and other structures, these proceedings will prove a valuable reference book for those directly in charge of such departments.

Earthwork Haul and Overhaul. By J. C. L. Fish, Professor of Railroad Engineering, Leland Stanford University. Size 6 in. x 9 in., 165 pages, 66 illustrations, cloth binding. Published by John Wiley & Sons, New York City. Price $1.50.

The author of "Earthwork Haul and Overhaul," has had in mind, in the preparation of the book, a number of different classes of readers, including railway engineers, contractors, computers, teachers and students. The material is divided into two parts, the first including seven chapters, covering such subjects as the mass curve, computation of the center of mass, overhaul, free-haul and crosshaul, and the computation of overhaul by eight methods for two different cases. Part II is devoted to "The Economic Distribution of Material Along the Profile," and discusses at length the economic balancing line for mass curves. An incidental feature of the book which has merit is the brief statement at the head of each chapter as to the contents of that chapter, enabling the reader to locate rapidly the material in which he is interested.

Letters to the Editor.

PLACING STONE BALLAST IN ONE LIFT.

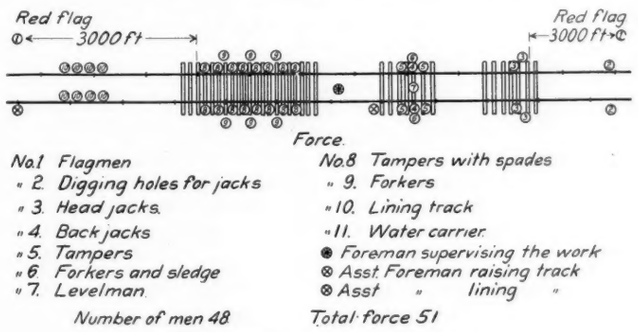
Batavia, N. Y., March 1, 1913.

To the Editor of the Railway Age Gazette:

The method which I have used when making a raise of from 10 to 12 in. in one lift, with stone ballast, was described in the *Railway Age Gazette* of May 17, 1912. Since the publication of this article I have received many inquiries regarding this method and desire to bring out a few points which may not have been made sufficiently plain in the article referred to.

The purposes of the system outlined are, first: to haul and unload the stone so that it will be put under the track the day on which it is received and unloaded; second, to distribute the men in the gang in such a way as to check their work, and, third, to keep the track in such line and level at all times that slow orders will not be necessary. While the cost of train service in order to arrange the work in this manner may be a little above the ordinary charges, this is more than regained by savings made by the track gangs.

Assuming that one mile of track is dug out by the stone ballast gang, the gravel being removed from between the ties to within 2 in. of the bottom, the track thus skeletonized, but not otherwise disturbed, is perfectly safe. A tie gang follows this skeletoning gang, renewing any defective ties, putting on



Distribution of Ballast Gang.

tie plates and regaging the track. As soon as enough track is thus prepared a train of stone is unloaded in quantities sufficient to raise the track the full height. This can be done by repeated dumping and plowing out. After the last dumping the ballast should be plowed from the ends of the ties and the men can then start in lifting the track, the gang being distributed as shown in the accompanying chart.

The forward jacks keep from 1½ to 2 rail lengths ahead of the rear ones, which pull the track up out of the freshly unloaded stone slightly above the finished grade. The two men marked (3) working at the ends of the ties, spade the stone roughly under the joint ties, the greatest part of the stone running down under the ties of its own weight. Tampers follow the rear jacks, spading the stone in under the tie and as far under the rail as they can reach. Immediately behind them are other men forking in ballast for them, who also carry sledges for tapping the ties down until they are level and at the proper elevation determined by the foreman and the levelman. Then, most important of all, come the tampers using spades and accompanied by forkers with ballast forks, who bring the ballast in to them. Each group of four tampers is numbered 1, 2, 3 or 4, and these numbers are marked on each half rail on the track being raised, or on the adjacent track. Each gang then tamps the half rail marked with its number and moves forward. In this way the work of each group can be noted and no confusion results. The lining gang follows up, keeping the track in perfect line as the work progresses.

Flags are put out in both directions as prescribed by rule

books and all trains are flagged while the lifting is in progress, but when trains are seen approaching, or when any regular train is due, a proper run-off is made. When everything is known to be in safe condition the train is signaled to proceed at the usual speed. Under ordinary traffic conditions and with the force of men outlined on the chart, from 800 to 1,000 cu. yds. of stone can be put under the track in the manner described in from 4.5 to 5 hours. The gang then goes back and tamps for 18 in. alongside the rail on each side, trims up the ballast and then goes ahead and digs out for the following day's work. Where necessary, the track can be kept filled in lightly close up to the tie gang.

A regular section force following up the lifting gang 8 to 10 days later does not find as much work to do as in an ordinary spring surfacing. A very light back fill, which is dressed down by the stone gang at the rate of a mile a day, completes the operation.

Among the advantages of this method are that the men always see the end of the day's work in advance, and therefore work to better advantage; the foreman of the gang is at all times engaged in directing his men and managing the work rather than in personally raising and lining, and no delay to trains is necessary.

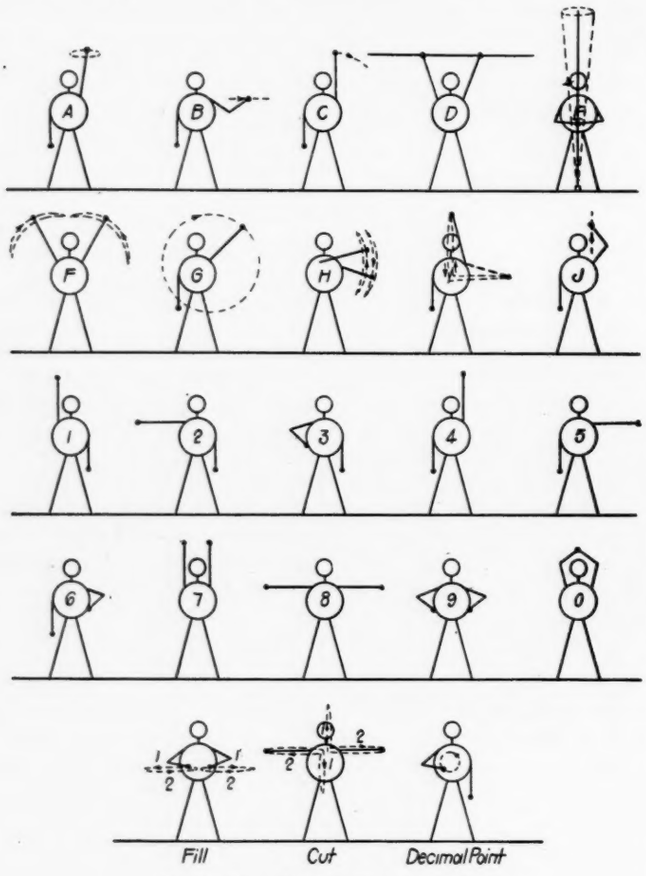
A. M. CLOUGH,
Supervisor, New York Central & Hudson River.

HAND SIGNALS FOR FIELD PARTIES.

KANSAS CITY, MO., March 20, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The accompanying set of hand signals for use in field work may add something to the recent discussion on this subject



Hand Signals for Field Parties.

which has appeared in your columns. (See *Railway Age Gazette*, February 21, 1913, page 351, and March 14, 1913, page 491.) The number signals are practically the same as those shown in Fig. 2 in your issue of March 14. It should be noted that in this system the vertical arm signals are used for the straight line numbers, 1, 4 and 7. In addition to the numbers, I have used signals for fill, cut and decimal point, which are attempts to make with the hands and arms, a minus, plus and point, respectively, as shown in the illustration. For additional transit party signals I have used those lettered A to I. The significance of these signals is as follows: A, "Rod up or give line." Wave a small horizontal circle high overhead with hand or rod. B, "Move to right or left." Move hand at shoulder height in direction required, slightly for a small, arm length for a big move. C, "Plumb rod to right or left." Extend arm vertically and swing slowly in direction required. D, "Set a hub or give a turning point." Hold any visible object horizontally overhead with both hands. E, "Set on this." With point of rod on tack, swing top of rod in small circle. F, "All right or go ahead." A half circle swing of one or both arms overhead. G, "Come to point signaled from." A full circle swing with either arm. H, "Go back." Face to the right of man signaled to, wave both arms up and down, raising one while dropping the other. I, "Can't get you." Describe an "L" or inverted "T" by a vertical motion followed by a horizontal motion of the arm. For a level party the same signals are used and in addition the one shown as J, "Move target up or down." Move hand up or down in direction required. Motion of hand only means move 0.01 of a foot, half arm 0.1, and full arm 1.0 ft.

It often becomes desirable in field work to send messages which are not covered by ordinary field signals. For this purpose I have used the number signals for code signaling by dividing the alphabet into three frames of nine letters each, the letters in each frame being numbered consecutively from one to nine, and each frame being given a distinguishing signal. The following chart shows the use of this code:

Frame Name.	Frame Signal.	Letter Numbers. 1 2 3 4 5 6 7 8 9
R(igid)...	Hold arm rigid in number signal position for a moment	a b c d e f g h i
S(wing)...	Wave small circle twice with arm extended in number signal position.....	j k l m n o p q r
P(unch)...	Punch into number signal position three times	s t u v w x y z "

The ninth signal in the third frame is the letter repeater or ditto signal. The hip signals in the swing and punch frames are replaced by corresponding signals with the arms extended vertically downward. The abbreviation msj is used for "message." A space between words is indicated by zero, and the end of a sentence by zero ditto. To use this code in the field it is only necessary to recognize the number and frame signals, messages being recorded by number and frame and worked out afterwards from a table similar to the one shown above. For example, "bring up hubs" would be received as follows:

29957	37	8321	9
0	0	0	0
rsrsr	ps	rprp	p

ROBERT S. BEARD.

[Since the publication of the hand number signals used on the Burlington lines west, it has been brought to our attention that this particular set of signals was devised to require the use of only one arm and hand. With this system, a rodman may hold his rod with one hand and give all necessary signals without changing his position, or in difficult locations, such as hanging on a bridge, on the side of a canyon or up in a tree, the signals can be given as readily as where both hands are free.—EDITOR.]

NEW RAILWAYS IN CENTRAL AFRICA.—The contract between the Nyasaland Protectorate and the British Central Africa Company for the extension of the Shire Highlands Railway has been signed. The Nyasaland government guarantees 4 per cent. for a period of ten years on $2,000,000, and it is understood that a new company is to be formed. A large tract of rich and populous country will be opened up by the construction of this extension.

NEW CLASSIFICATION YARD AT WINNIPEG.

Canadian Pacific Is Now Building the First Section of a Gravity Yard Designed for Twelve Thousand Cars Ultimate Capacity.

The old classification yard of the Canadian Pacific for the Winnipeg district is just west of the passenger station in the heart of the city, and on this account, further expansion to care for the constantly increasing freight traffic has not been possible. The congestion in this yard, especially during the movement of grain from the western provinces to the lake ports during the fall has been a serious problem for several years. In order to relieve this situation and to provide for further increases in traffic, it was decided to build an entirely new yard near Winnipeg, which would handle all the classification of through business and would be so located as to be capable of expansion to almost any desired extent. The location selected for this yard is about five miles east of the city and just east of Whittier Junction, where the old main line to Molson by way of East Selkirk joins the line commonly known as the Molson branch, over which the main line traffic to the east is routed at present. The new yard lies between these two lines, its eastern end having connection with the Molson branch and the western end with the main line.

Filling for the Eastbound Hump.

A careful study of the requirements for a complete yard development in this vicinity was made by representatives of Westinghouse, Church, Kerr & Company in conjunction with the engineers of the Canadian Pacific, and as a result of this study, plans for an initial development to care for present demands of traffic and a maximum development to provide for expansion in the future were prepared. It was planned to have at least a portion of the yard in service in time to relieve the congestion during the grain rush last fall, but the unusual shortage in labor during the season made the accomplishment of this purpose very difficult. It is expected that the initial development will be completed during the present season. The yard that is being built at present, shown by solid lines in the accompanying drawing, provides the follow capacities:

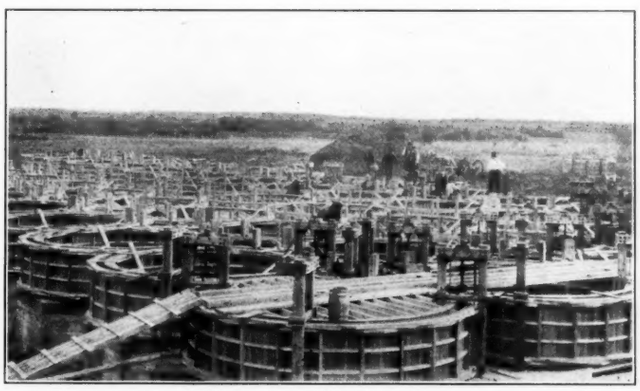
Westbound receiving yard	20 tracks	1,440 cars
Westbound classification and departure yard	20 tracks	1,440 cars
Eastbound receiving yard	20 tracks	1,440 cars
Eastbound classification and departure yard	20 tracks	1,440 cars
Westbound hold yard	5 tracks	325 cars
Eastbound hold yard	5 tracks	325 cars
Westbound caboose yard	4 tracks	24 cars
Eastbound caboose yard	4 tracks	24 cars
Repair yard	12 tracks	180 cars
Transfer yard	4 tracks	125 cars
Icing yard	4 tracks	140 cars
Cold storage yard		40 cars
Total car capacity		6,943 cars
Engine yard		24 engines

The maximum development which is shown by dotted lines in the drawing provides for the following capacities:

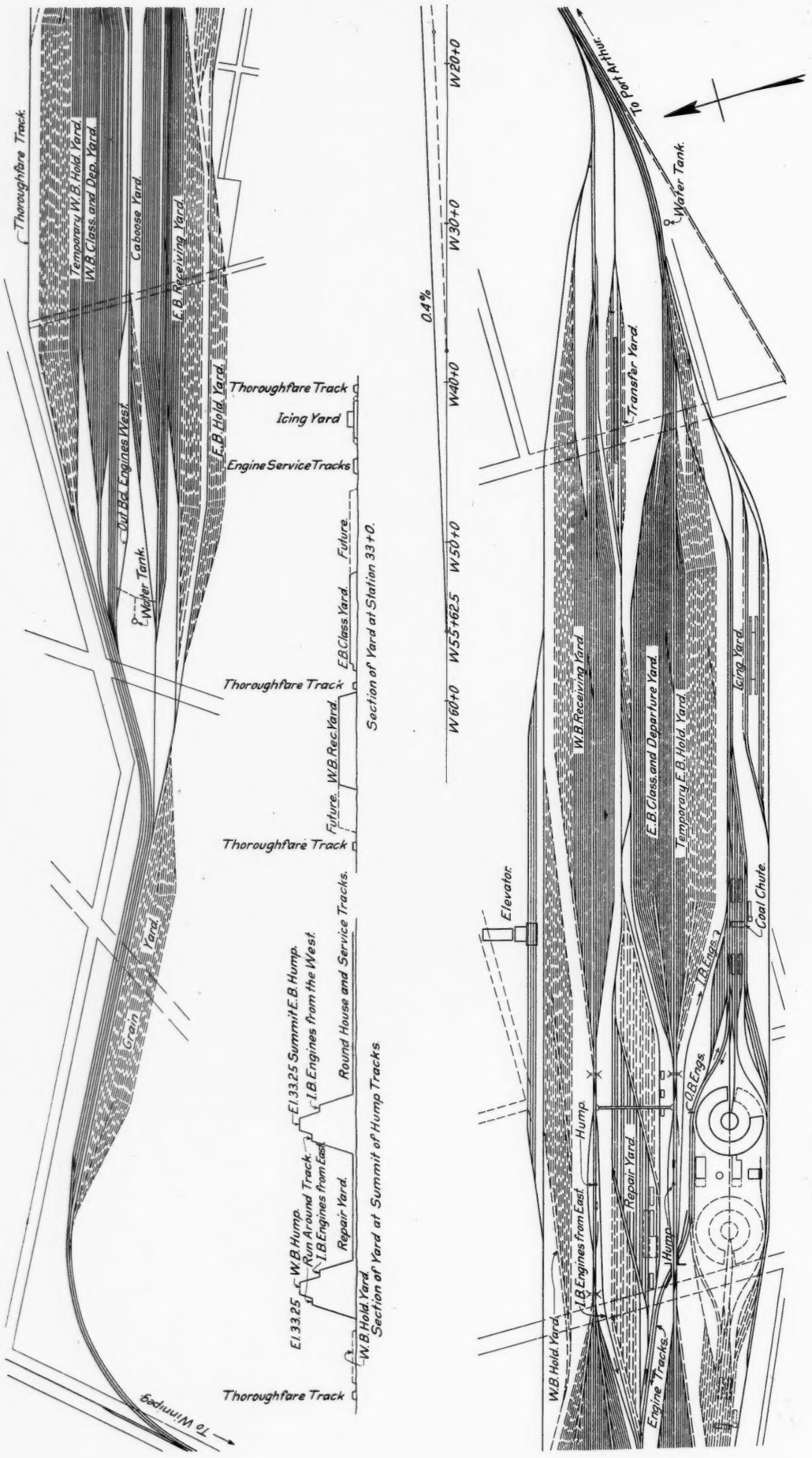
Westbound receiving yard	30 tracks	2,090 cars
Westbound classification and departure yard	40 tracks	2,740 cars
Eastbound receiving yard	30 tracks	2,090 cars
Eastbound classification and departure yard	40 tracks	2,880 cars
Westbound hold yard	24 tracks	600 cars
Eastbound hold and grain yard	24 tracks	1,160 cars
Westbound caboose	7 tracks	40 cars
Eastbound caboose	7 tracks	40 cars
Repair yard	32 tracks	410 cars
Transfer yard	8 tracks	225 cars
Icing yard	6 tracks	200 cars
Cold storage yard		80 cars
Total car capacity		12,555 cars
Engine yard		48 engines

The cars will be classified by gravity over separate humps for eastbound and westbound business. The hump profile, shown in the accompanying drawing, shows steep grades at the hump, which experience with the operation of hump yards in northern latitudes has proven to be essential during the winter months. In the yard which the Canadian Pacific is now operating in Winnipeg, the hump has been raised once and operating men still complain that in some cases it is necessary for the hump engines to push the cars down the grade. As shown in the profile, runaround tracks are provided at both humps to allow movements to be made between the receiving and departure yards without pushing over the hump. Additional tracks on a lower grade are provided for incoming engines to reach the engine terminal after cutting off from their trains in the receiving yards. The yard is designed to allow facility of movement between the various parts and an ample number of thoroughfare tracks has been provided. The repair yard is located between the humps and the engine terminal is adjacent to the eastbound hump. This arrangement allows the hump tracks to be carried straight into the classification yards and utilizes the space between the humps to good advantage. It also serves to bring all the buildings into a very compact group.

The engine terminal which is being built to serve the initial development of the yard, includes a 30-stall engine house of brick on concrete foundations, having a 100 ft. turntable, a machine shop to care for running repairs, a power house, a boiler shop, store building, concrete cinder and inspection pits, a coaling station of the T. W. Snow Construction Company's design, coaling on four tracks with provision for an extension to a fifth track, and a 60,000 gal. water tank. The water supply for this terminal is secured from the Red river through a 12 in. pipe line about four miles long. A pumping plant and continuous water softening plant has been installed at the river. The plans for the maximum development of the yard call for the extension of the present engine house to 55 stalls and the building of a second engine house adjacent to it, also of 55 stall capacity, the building of a freight car shop and a woodworking shop along-



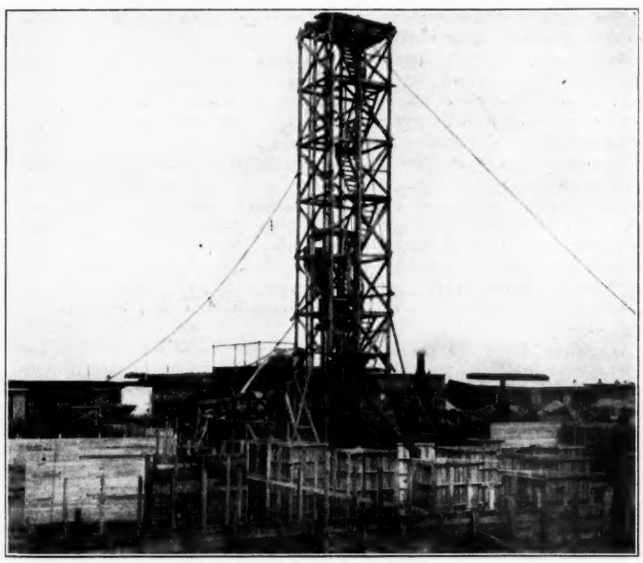
Forms for Concrete Grain Storage Bins with Jacks Used in Raising Forms.



Plan, Profile and Cross Section of Canadian Pacific Yard Near Winnipeg.

side the blacksmith shop which is now located in the repair yard, and the addition of the necessary cinder and inspection pits, coaling stations and water cranes.

The construction of the yard will require about 2,500,000 yds. of filling material for the initial development. The yard is located on a level prairie, and no excavation is required except for the buildings. The maximum fill under the humps is about 38 ft. Gravel is being used for the fills, which is secured from a company pit at Moose Nose, about six miles east. It is excavated with a 90 ton Bucyrus shovel equipped with a five yard dipper, and is hauled to the yard in 60 12 yd. Western air dump cars and 60 16 yd. cars by eight standard gage locomotives. The contractor's equipment for the work also includes a Jordan spreader and a Brown hoist locomotive crane for use in the material yard. The line between the yard connection and the gravel pit was double-tracked in order to facilitate the handling of the 20 or more gravel trains which were operated each day. The operation of these trains on the main line was safeguarded by issuing train orders for each one and placing a pilot on each engine. In making the fill for the yards, trestles were built under the humps and in all fills exceeding 12 ft. The trestle under the hump was built to the grade of the runaround track and the additional material was placed by raising tracks on this



Stock Piles, Cement Houses, Mixer Plant and Distributing Tower at Elevator.

fill. For the yard tracks, the fill was started under the track in the middle of the yard and this embankment was widened on both sides by spreading and shifting tracks. No system of cross drainage was laid in the construction of these yards, but in each of the streets crossing the site of the yards, which were closed when construction work began, a culvert was laid. In order to secure an outlet for this drainage, a 24 in. sewer almost four miles long was built. If any difficulty is experienced with the drainage, it is possible that a system of subsurface cross drainage will be installed.

The yard tracks are laid with soft ties untreated and new second grade 85 lb. rail on ladders and humps and relaid 75 lb. and 85 lb. rail for yard and thoroughfare tracks. All switches will be tie plated. No. 7 turnouts will be used with 1 deg. curves beyond the frog point.

Four subways will be built under the humps, three for footways and one for two engine tracks. The latter structure is being built on a skew of 52 deg. 29 min., requiring an unusual design of abutments and retaining walls, which is illustrated in the accompanying drawings. As shown in these drawings, the abutments are offset between tracks forming square bridge seats on which are carried deck plate girders. The span is 63 ft. face to face of abutments. Reinforced concrete is used for these abutments, and in order to insure stability, a system of concrete struts or tie rods, shown in the plan, was included. The footings are supported on wooden piles spaced about 3 ft. x 3 ft. 6 in., with a row of batter piles 3 ft. apart driven under the toe of the retaining wall. The batter piles and the front rows under the abutments are 30 ft. long, the others 25 ft. long.

In connection with the yard there is being built a transfer elevator served by four tracks alongside the westbound receiving yard. This elevator has a capacity of 1,000,000 bushels, and is being built of reinforced concrete throughout. It will be possible to receive, clean, and load out 12 cars an hour at this elevator, and to dry 1,000 bus. of grain an hour. The storage capacity will be secured by 140 cylindrical concrete bins so that the individuality of grain passing through the elevator can, to a large extent, be maintained. The general arrangement of the plant provides for the possible increase of capacity to 15,000,000 bushels. The elevator machinery will all be electrically operated.

In the construction of this elevator an extremely complete and well designed concrete mixing plant was used. Two 28 cu. ft. Smith mixers were installed alongside the building with towers equipped with elevating buckets and distributing spouts. Narrow gage tracks, on which were operated 1 yd. dump cars, connected these mixer towers with the material piles alongside the standard gage spurs and cement houses, each of the latter having a capacity of 1,500 bbls. In operating the mixer plant a narrow gage car was filled with a specified amount of aggregate at the material piles and pushed up to the cement house in front of which was a platform level with the top of these cars. Here the required amount of cement for the aggregate contained in the car was dumped and the entire mixture was pulled up an incline to a platform above the mixer from which the charge could be placed in the mixer. The mixer dumped into the elevating bucket, which was of a capacity sufficient to hold the entire mixer batch and which was dumped into a hopper feeding the distributing spouts by a man stationed at the top of the tower. The construction of the head houses and bins required from 16,000 to 18,000 yds. of concrete. With each of the plants described, it was possible to place about 250 yds. in a ten hour shift and the average was not less than 200.

A special jack for raising the forms used in construction of the cylindrical storage bins was developed by the contractors, and has now been made standard by them for this work. This jack is shown in the accompanying photograph. It consists of two 6 in. x 6 in. timbers placed over a section of the form about 4 ft. high and rigidly connected to it. These timbers are yoked together at the top, and through this yoke extends a 1 in. rod about 8 ft. long, the lower end of which can be brought to bear on the finished concrete when it is desired to raise the form. By operating the screw in this yoke the entire form is raised, the downward thrust being carried by the hardened concrete. Four of these jacks are commonly used on a tank of 14 ft. 4 in. diameter. The lift is ordinarily 12 in., although sometimes the forms are moved for distances not exceeding 4 in. This work was handled by the Barnett & McQueen Company, Minneapolis, specialists in elevator construction.

The contract for grading, track laying and subway construction was let to Foley Brothers, Welch & Stewart. The grading and track laying was sublet to the John Marsch Construction Company. The engine house and other buildings in the yard were contracted for by the Lyall Mitchell Contracting Company. The work was handled under the general supervision of J. G. Sullivan, chief engineer, and Frank Lee, principal assistant engineer. W. D. Pender was in direct charge of the work.

New Line in the Uganda Protectorate.—The 47-mile Jinja-Kakindu Railway from Jinja, on Lake Victoria, to Kakindu, toward Lake Kioga, was formally opened for freight traffic on January 1. This railway will form an important link in the rail, river, and lake service between Cairo and Mombasa.

THE FOREMAN PROBLEM.*

By A. Swartz,
Engineer, Maintenance of Way, Toledo Railways & Light Co., Toledo, O.

A track foreman today must be better educated than he was years ago. His duties require that he be in closer touch with the public at large, as well as better informed on the laws of different states which require things of railways that years ago were not thought of. As the territory east of the Mississippi river becomes more thickly populated, the source of supply of section foremen naturally decreases, for the average young man today looks upon this position as a menial one. This is a wrong view of the matter, for it is only a question of time before railways will pay salaries more commensurate with the ability demanded of the section foreman. It is therefore necessary to interest young men in this question, and it is possible to do this if roadmasters will take the trouble to visit small towns on their division, trying to find young men who, if they see before them in two or three years a position which will give them $65 to $75 per month can be talked into going on the section.

It is necessary, however, to have on each section a leading man, who is paid from 10 to 20 cents per day more than the rest, because of his trustworthiness and capability. This man should be allowed ten hours pay per day all the year around, and if extra time is to be put in, he should be given a chance for the extra money. A foreman who is properly talked to is usually very glad to help a young man and teach him how to run a section gang, as well as to take care of all reports necessary. One of the duties of this first man should be to handle the gang and reports, under the supervision of the foreman. A good class of young men to interest, are the teachers of country schools. They are generally educated enough, and know the people in their district well enough to become good foremen, provided of course they are physically able to carry on the work. One of the greatest hardships for a section foreman, is his reports. They scare the ordinary individual, even though for a man of ordinary education they are very simple to make. The prevalence of foreign labor on railways today requires a man who has a great deal of patience, which is generally one of the perquisites of a school teacher, and this surely is more marked in a man with a fair education. Foreign labor will, if handled with discretion, do good work, but if handled by a strong-minded, uneducated person, will not give good results.

There is a great deal of responsibility attached to a foremanship, which requires an honest man. The average foreigner is not, in the writer's opinion, the proper man to trust with such responsibility, although there are cases where Italians or other classes of foreign laborers have been developed into very fair track foremen.

It has been the practice on the Erie, with which I served until recently, to give the leading man more pay than the rest of the laborers. The roadmasters themselves, watch this matter closely and keep in touch with such men. When extra gang work is at hand, these men are placed in charge of a small squad doing the more unimportant work and their results are watched. In this way it is easy to see whether the man will make a fit foreman or not, for in no other place will a man's patience be tried as with an extra gang. A division engineer should know these men just as well as his roadmasters, so that the question which is so vital to him may be properly taken care of.

One of the things which will help educate foremen is for the railway to develop certain rules or practices which can be put in a printed form and distributed to the foremen. The first man should have access to these forms so that he may become acquainted with the practices and rules of the railway for which he is working. This naturally results in a uniformity of practice over the entire road, so that the foreman or a first man may be transferred to any section, taking up the work where it was left off, and under ordinary conditions be sure of the men working for him being able to carry on the work without any very great change in the method. Meetings should be held occasionally to see if the men themselves have developed any ideas which would be well to use on the whole system or on one particular division.

*Received in the contest on The Foreman Problem, which closed March 25, 1912.

ABSTRACT OF ENGINEERING ARTICLES SINCE MARCH 14.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since March 14, 1913:

Important Improvement Work on the C. M. & St. P.—A typical example of the double tracking and grade revision which is being undertaken on a considerable mileage of central western roads is that of the C. M. & St. P. on its Hastings and Dakota division. The most unusual feature of this work was the very extensive use of drag line excavators. The engineering features of this improvement work were described and illustrated in the issue of March 21, page 673.

New Classification Yard at Chicago.—Plans have just been announced by the Belt Railway of Chicago for enlarging the clearing yard to a capacity of 12,000 cars, which will make it, so far as is known, the largest hump yard in the world. The plans for this enlarged yard were given in the issue of March 21, page 679.

Report on Glen Loch Derailment.—An abstract of the Interstate Commerce Commission report on the derailment of a passenger train on the Pennsylvania Railroad at Glen Loch, Pa., which includes the recommendations of the commission's representatives as to inspection of steel bridges, was published in the issue of March 28, page 747.

Economical Limits of Grade Reduction, by Walter Loring Webb.—This paper presented a very complete discussion of the factors entering into an analysis of train resistances and their respective importance. It was published in the issue of March 28, page 750. An editorial commenting on this subject appeared in the same issue, page 740.

A Novel Design for a High Abutment.—An unusual design for an abutment on the Lehigh Valley, which is known as a pier abutment, was described by E. F. Ackerman, assistant engineer, in the issue of March 28, page 759.

The Sand Patch Tunnel Improvements.—The construction of a new double track tunnel on the Baltimore & Ohio at Sand Patch, Pa., which was complicated by two disastrous slides over the existing single track tunnel, was described in the issue of April 4, page 789.

The Design of Concrete or Reinforced Cross Ties.—Paul M. La Bach, assistant engineer, Chicago, Rock Island & Pacific, Chicago, presented a discussion of the mechanics to be considered in the design of crossties in a letter to the editor published in the issue of April 11, page 828.

National Valuation Convention Urged.—A discussion by H. Bortin, in which concerted action by the railways was urged to make the appraisal of railways economical, intelligent and just, was published in the issue of April 11, page 836.

Southern Railway Freight Station and Office Building at Atlanta, Ga.—The design and construction of a large modern freight station on the Southern Railway was described and illustrated in the issue of April 11, page 839.

The Southern Pacific Bridge at Sacramento.—An unusual swing span has been built by the Southern Pacific over the Sacramento river, Sacramento, Cal. It is a double track, double deck structure with a highway on the upper level, having a concrete floor under the highway. It is believed to be the heaviest swing span ever built. The structure was described and illustrated in the issue of April 11, page 846.

The Otis Inclined Freight Elevator.—A description of the inclined elevators for moving truck loads of freight from a steamer to the Union wharf at Boston, Mass., including the amount of freight handled in the last three years and the cost of power, was published in the issue of April 11, page 849.

Indian Railway Needs.—The Indian press is urging the necessity of encouraging feeder railways. If all feeders and branches, and, where possible, extensions, were financed by private enterprise, then the whole, or almost the whole, of the railway budget could be devoted to the needs of the open lines. The composition of the present railway board is blamed for the difficulties at present attending the promotion of these schemes, and the solution suggested is the appointment of a single railway controller, attaching to the post a salary sufficient to attract a first-class man, as is done with the finance member, and giving him the full status of a member of the Executive Council.

DESIGN AND MAINTENANCE OF TRACK TANKS.*

Discussion of the Location, Length and Width of Troughs, the Two Types of Heating Systems and Roadbed Drainage.

By George W. Vaughan,
Engineer Maintenance of Way, Exterior Zone, New York Central & Hudson River.

The railroads of England felt the need of supplying water to moving trains as far back as the middle of the nineteenth century and for this purpose J. Ramsbottom invented an outfit, including a track tank between the rails and a scoop on the locomotive tender, in 1861. The track tank or trough was of cast iron, in lengths of about 6 ft., these sections being bolted together by means of flanges and the ends separated by strips of vulcanized rubber. It has been supposed that this was the first track tank ever put in service, but a few years ago F. W. Webb, chief mechanical engineer of the London & Northwestern, claimed that they were introduced on that road in 1857, and that he was engaged in preparing the first equipment.

The first track tank in the United States was built at Montrose, between New York and Albany, on the Hudson division of the New York Central & Hudson River, and was put in service in 1870. It was for the use of the fast Saratoga trains at that time and was supplied with water by a hand pump, no provision being made to prevent freezing, as its use was discontinued in the winter. William Buchanan designed the first scoop, then called a "jerk water." It was attached back of the rear trucks and the conductor pipe was placed back of and outside of the tender tank. The first track tank on the Mohawk division was installed at Palatine bridge about 1889, and the first one on the Western division at Churchville in 1892. They were first installed on each of the four main line divisions of the Lake Shore & Michigan Southern in 1893, and at Forks Creek, Tilbury and Waterford on the Michigan Central in the same year.

The use of track tanks on the main division of the New York Central Lines has now become quite general. There are 14 on the New York Central & Hudson River, between New York and Buffalo, 10 on the Lake Shore & Michigan Southern, between Buffalo and Chicago, and 14 on the Michigan Central, between Buffalo and Chicago, so that trains can now run from New York to Chicago without making a single stop for water, except at the terminals, where the locomotives are regularly changed.

LOCATION.

Track tanks are generally used on lines and divisions where traffic is dense. From 25 to 50 per cent. of the water supplied is usually wasted by the engine scoops forcing it over the sides and ends. It is, therefore, essential that they be located where the supply of water is abundant, and since on account of the large waste the ground under them will be continually soaked, they should be placed on ground that can be thoroughly and quickly drained.

They can be operated and maintained on light curves, the Philadelphia & Reading having one, a large portion of which is on a 2 deg. curve, but they give much better satisfaction and are cheaper to install and maintain on tangents. The grades approaching them must be such that all trains which are to take water can attain a speed of at least 25 miles per hour before reaching them and, for the same reason, they should not be near stations, yards, railroad crossings, drawbridges, etc.

TYPE.

Many roads followed the early practice of making the tanks of cast iron and bolting the sections together. The Chicago, Milwaukee & St. Paul had such a tank in use until recently between Chicago and Milwaukee. The general practice now is to make the tank of sheet steel or iron, 3/16 in. to ¼ in. in thickness, bent to the desired form. In England many of them are supported on wooden stringers fastened to the ties, the top edge of the tank being bent over and bolted to the top of the stringers, but in this country they are usually supported directly on the ties, angle and half-round irons being riveted to the upturned sides and top edge to furnish stiffness and a means of attachment by spiking or otherwise to the ties.

The new standard of the New York Central & Hudson River deviates essentially from general practice, in that, instead of the customary plate turned up to form the sides, it has two channels, with flanges turned in, which form the sides, and a flat plate which forms the bottom. It has the following advantages: It is cheaper to construct, considering the same dimensions and weight of material. The bottom of the troughs wear out much more quickly than the sides, on account of being scraped by the scoop, and this type permits the renewal of the bottom separately, thus saving considerable on repairs. Repairs are made more easily.

DEPTH.

The Midland Railway of England has on its locomotives an adjustable scoop which is lowered on approaching track tanks to a fixed point ½ in. below the top of the rail. The track is depressed at the trough, 6 in., the grade at the beginning and end being 1 in 360, so that the scoop dips automatically into the trough about 3 in. This arrangement permits the trough to be made as deep as desired, without even cutting into the ties.

In America the bottoms of the hopper cars, the brake rigging and other apparatus does not have as great a clearance as in England, and it is not considered good practice here to allow anything between the rails that projects above the top of them. This fixes the upper limit for the top of the track tank.

The ties under the troughs are usually 8 in. thick, and it is not considered safe to dap them more than 2¼ in. This fixes the lower limit for the bottom of the tank. The tanks, after a time, become somewhat uneven, often varying in height ½ in. or more. It is not practical, therefore, with a 6 in. rail to increase the depth of the tank beyond 7½ in. or 8 in. The general practice is from 6 in. to 7½ in.

Adjustable scoops are arranged so that they cannot be lowered beyond a certain point, that point being determined by the requirements of any particular railroad. The pins and bearings of the scoop, also the bearings and tires of the tender wheels wear appreciably, making a difference in adjustment sometimes as much as ¾ in. The springs under the tender become weaker with age, allowing the tender, with the scoop, to sag. Therefore, unless the adjustment is watched closely and carefully regulated it is apt to vary considerably.

The height of the tender and scoop will sometimes vary an inch or more between light and loaded conditions. Tests show that the pressure of the water against the scoop when traveling at speeds from 40 to 60 miles per hour, will pull the tender down from ½ to 1 in., while at speeds from 25 to 40 miles it will be affected very little. Therefore, when a scoop is lowered into a trough it is necessary to allow for a possible variation in elevation of about 2 in.

It is desirable to adjust the scoop high enough so that it will not scrape the bottom of the trough. The troughs, after a time, become uneven, making it difficult to maintain the water level less than an inch from the top. Observations indicate,

*Abstract of Appendix A of the Report of the Committee on Water Service, American Railway Engineering Association.

and it is generally conceded, that the scoop, under all conditions must dip at least 2 in. below the surface of the water, in order to deliver an adequate supply into the tender tank. To meet all these conditions it is evident the track tank must be made as deep as construction considerations will permit.

Therefore, a depth of 7½ in. should be used if a track tank of the usual type is adopted, or a depth of 7 in. if a type similar to the New York Central & Hudson River standard is adopted, so as to use a standard channel.

WIDTH.

The most usual width of track tanks is 19 in. This gives about the least clearance permissible in this country, as American scoops are generally from 12 to 13 in. wide, and allowance must be made of about 2 in. on either side for swaying. The Midland Railway of England uses tanks 17¾ in. in width, but their scoop dippers are only 10 in. wide. Tanks with widths all the way up to 29 in. are being used in this country.

The only reason of any consequence for employing an inside clearance greater than 19 in. is to create sufficient storage capacity so that water may be scooped by the second engine of a double header, or by a second train following the first so closely that enough time has not elapsed for the refilling of the tanks. On the other hand, the use of the wide tank is objectionable, as experience indicates that with it considerably more water is wasted by the splashing of the scoop, and this is especially true when the scoop is adjusted too low, as is often the case.

The Pennsylvania Railroad made some exhaustive tests in 1906 with its standard scoop, which showed that when the locomotive was traveling at 40 miles per hour, which is considered the most economical scooping speed, 75 per cent. more water was wasted with a 29 in. trough than with one 19 in. wide. The results of the 1910 tests by the same road indicate that, with the narrow trough, the waste is much less at all scooping speeds. It requires more steam to prevent the wide tank from freezing, the difference being about in proportion to the surface exposed. It is stated by some authorities that the difference is even greater than the proportions of exposed surface would indicate.

The New York Central & Hudson River made some tests in 1910 on a 27 in. trough, which showed that the amount of water taken by the second engine of a double-header was approximately 25 per cent. of the amount taken by the first engine, in the same distance, each scooping at the same time. When double-headers are used, generally the engineers arrange that one will take water for the first half of each trough, and the other for the second half, and, of course, with wide troughs the second gets some additional water, while the first is scooping, but this small extra amount can be more economically supplied by using a narrow tank and increasing its length. This will increase the first cost and the cost of maintenance a very little, but will reduce the expense of operation quite a little, on account of the reduction in waste of water, which in turn will reduce the cost of maintaining the roadbed. It is customary to place at least three inlets in each trough, so that they may be refilled quickly. Enough additional inlets may be installed at very little expense to accomplish the refilling in as short a time as it is practical to operate one train after another, so there is no excuse for putting in a wide tank to enable the operation of trains following each other closely. It follows, therefore, that a width should be adopted that will provide an inside clearance of 19 in.

LENGTH.

The length of various track tanks varies from 1,300 ft. to 2,500 ft. The standard lengths adopted by some railroads are as follows:

New York Central & Hudson River	1,400 ft.
Pennsylvania	1,500 ft.
Midland Railway of England	1,633 ft. 6 in.
Michigan Central	1,800 ft.
Lake Shore & Michigan Southern	2,000 ft.

The last-named road has installed some 2,500 ft. long in order to furnish an adequate supply for heavy freights and double-headers, but on account of the difficulty in maintaining such a long pan level, it found it advisable to cut the length down to 2,000 ft., which appears to be about the practical limit.

The most desirable length for any road must be determined by a consideration of the usual train tonnage, the grades and the distance between track tank stations, which in turn is generally governed by the available supplies and convenient locations.

Some observations were taken on the New York Central & Hudson River, where the grades are moderate, in 1910, which show that heavy passenger trains of eight to twelve cars consume from 80 to 100 gal. of water per mile, and that freight trains of about 50 loaded cars consume from 110 to 130 gal. per mile. Other observations taken by the same road during a test, show that its standard scoop will normally deliver into the locomotive tank about 230 gal. per 100 ft. scooped at usual speeds.

The large locomotives have water reservoirs with capacities ranging from 7,000 to 8,000 gal., which is sufficient to carry a heavy freight train at least 50 miles. On the New York Central & Hudson River the divisions where track tanks are used are from 140 to 150 miles long, and the track tanks are from 20 to 40 miles apart, the average distance being about 30 miles. Trains will, therefore, consume from 2,500 to 4,000 gal. of water, on the average, for a division in going from one track tank to the next.

The pans being 1,400 ft. long, permit scooping for a distance of 1,300 ft., and in that distance the scoops will deliver 3,000 gal., which equals the consumption in the majority of runs. In the case of those trains consuming upwards of 4,000 gal., it may be stated that the reserve supply in the locomotive tank at the beginning of the run will supply the deficiency. The conclusion is therefore reached that the present standard length is sufficient, except on rare occasions, under adverse conditions, and when double-headers are used. The proper length under other conditions could be determined in the same manner.

END SECTIONS.

Track tanks are generally none too long to furnish an adequate supply, and frequently enginemen, trying to get all the water possible, will leave the scoop down so long that it hits the end of the trough. Sometimes this occurs at night, when the markers have been extinguished accidentally or otherwise. Therefore, in order to avoid the cost of repairs, and more especially to prevent interruptions to the service, it is desirable to construct the end sections so that the scoop will ride over them without inflicting damage.

The incline plate of the Pennsylvania is very short, constructed on an eased curve and is backed by wood. That of the Lake Shore & Michigan Southern is extremely long and solidly constructed. Those used on the Michigan Central, the Philadelphia & Reading, and the New York Central & Hudson River are of medium length, the first two being backed with wood and the last backed with plates of iron at the lower end and stiffened by angles throughout the remainder.

Every one of these examples is reported to be giving excellent satisfaction and there appears to be little to choose between them. It would, therefore, seem advisable to adopt a straight incline of medium length, say, 10 ft., the trailing incline to be of the same length so that traffic may be reversed when desired. The plate should be ½ in. in thickness and backed with hardwood or stiff angle irons.

ROADBED AND DRAINAGE.

Every railroad that operates track tanks in a cold climate realizes how difficult it is to dispose of the water spilled from scooping quickly enough to prevent it from freezing and heaving the roadbed, and throwing the track out of alinement. In the first place, the plant must be located where drains and ditches can be constructed that will carry away the water

quickly and thoroughly. In the second place, the roadbed must be built up or constructed in such a way as to prevent, as far as possible, the water from seeping down through it, and so that the water may be carried away over a surface or paving that will not be easily washed out, to properly constructed and located surface drains, ditches, catch basins, subsurface drains or tunnels, or some combinations of these arrangements.

It is regarding these details that the practices of various railroads differ. The Lake Shore & Michigan Southern has developed its drainage system further than most companies. They cover the ballast between the tracks with heavy flat stones and grade them to catch basins about 55 ft. apart. This paving prevents the ballast from being washed out and drains the water quickly into the catch basins. Subsurface tile drains, extending longitudinally between the tracks, carry the water from the bottom of the catch basins into underground transverse tunnels, spaced about 333 ft. apart.

A considerable percentage of the spill always soaks through the ballast between the ties and between the paving blocks. If the subgrade is not of a character to readily dispose of this, a layer of slag 2 ft. in depth is placed below the ballast. This allows the water to find its way gradually to the catch basins and subsurface longitudinal drains, which are laid with open joints.

The New York Central & Hudson River also lays a graded stone pavement between the tracks, but instead of removing the surface water through catch basins and subsurface drains, they install transverse surface box drains every 50 ft., which are very effective for this purpose, and have the advantage of being easily kept open in winter. They install graded trenches filled with cobbles under the pavement longitudinally between the tracks and place transverse subsurface tile drains every 100 ft. This arrangement very readily removes the water which finds its way through the pavement and ballast.

No figures were available to show the comparative cost of the two schemes; however, the cost of the former should certainly exceed that of the latter considerably, the amount depending somewhat on local conditions. It is pointed out that the tunnels serve the double purpose of providing an outlet to the drainage system and an accessible conduit for the water pipes, but the water pipes can be installed and maintained easily without the tunnels, so that most of this cost should be charged up to the drainage.

It would seem that this layout should be provided with the means to more readily dispose of the surface water in winter, when the catch basins become frozen over, by the addition of transverse box drains on the surface at each catch basin.

The New York Central & Hudson River Railroad layout disposes of the surface water quickly and is easily kept open in winter. It will dispose of the subsurface water more quickly than the other scheme and is preferable, as it will cost less to install and maintain.

STEAM AND WATER PIPING.

The water in all track tanks on the New York Central Lines must be heated in winter to prevent it from freezing, the amount of heat required depending upon the temperature of the supply and the atmosphere, the amount of water surface exposed, the frequency of scooping and the method of applying the steam to the water. The character of the heating system determines to a large extent the arrangement of water supply piping, necessitating a consideration of both piping systems at the same time.

Modern installations comprise in general one or more water pipes, extending nearly the full length of the troughs, with several branches connected to trough inlets. The supply is controlled by automatic valves actuated by a change in level of the water in the trough. If water is supplied through an inlet faster than it can flow along the trough by gravity, it will overflow at that point, causing considerable loss without increasing the rate of filling. This restriction is modified somewhat by the use of baffle plates in the inlet boxes or by dividing the inlet, discharging the water from the two sides of the pan instead of from the bottom; but, at best, the rate of flow is limited, and it is necessary to provide three or more inlets to each trough, the number depending upon the desired rate of filling.

At Herkimer, on the New York Central & Hudson River, where the troughs are 1,400 ft. long and 27 in. wide, and supplied by three inlets each, tests showed that after an engine had scooped full length, the pan would refill in from four to six minutes, the time depending upon the adjustment of the valves and somewhat upon the wind. After one engine had scooped full length, a second engine following in one and one-half minutes took one-half of a normal supply, and in three minutes a full normal supply. The reason a full supply could be obtained before the trough was entirely refilled was due to the fact that the scoop was given a deeper immersion than necessary, taking in more water when the trough was full than it could deliver into the tender.

There does not appear to be much data available regarding the rate of refilling troughs, but our observations indicate that with the inlet valves adjusted to give the maximum permissible rate of discharge and with the inlets spaced about 450 ft. apart, the trough will refill quickly enough to enable trains to get a full supply when operated on a three-minute headway, which meets all practical requirements.

There are in general use two methods of applying steam to the water to prevent it from freezing, known as the "direct" and "circulatory" systems, respectively. The former requires one or more pipe lines extending the full length of the troughs, with branches at frequent intervals, discharging steam through small nozzles directly into the bottom or sides of the trough. There is always more or less surging of the water in the trough, due to scooping and refilling and to the action of the wind, so that, with the nozzles spaced at intervals of 33 ft. (as in the New York Central & Hudson River standard), the heat is very evenly distributed. It is, therefore, unnecessary to maintain the temperature of the water at any point much above the freezing point, which insures a minimum loss of heat, due to exposure to the atmosphere. The steam pipes, whether laid below or above ground are thoroughly covered to prevent loss of heat from that source as much as possible.

The circulatory system, as used at various places, differs somewhat in the details, but its application on the Lake Shore & Michigan Southern, is typical, and is probably more perfectly developed there than anywhere. The standard, which applies to troughs 2,000 ft. long, shows a 4-in. water main for each trough extending nearly the full length. These are called circulatory pipes, and each has seven connections with its trough, three connections being inlets and four outlets, the inlets and outlets alternating. Steam is discharged into each inlet connection by means of ejectors, so that the water is forced to circulate while being heated.

The distance between inlets and outlets is about 333 ft., and when the trough is full it is not permissible to maintain a much greater depth at the inlet than at the outlet; the rate of circulation is therefore limited, and it is found necessary in severe weather to maintain a temperature at the inlet of about 60 deg. Fah., in order to prevent the water from freezing at the outlet. Accordingly, the loss of heat due to exposure to the atmosphere is much greater than when the direct heating system is used.

The troughs must be watched closely, when scooping is not frequent, in order that any ice which may happen to form can be promptly removed, otherwise the ice will impede circulation, allowing a considerable section of the trough to freeze up quickly, with no means of thawing it out. After scooping the trough is refilled by means of automatic valves at each inlet connection, the water being supplied through a separate water main, which extends to each inlet pit.

It would appear that, under similar local conditions and re-

quirements, the circulatory system would necessitate more piping, and, as the loss in heat must be greater, a larger boiler plant would be required, each condition operating to increase the cost of installation and maintenance. The fact that more heat is required would also cause the cost of operation to be greater. If it was desired to multiply the number of inlets, the difference in cost of installation would be increased, while the difference in cost of operation would probably be decreased, as it would not be necessary to heat the water to as high a temperature.

CONCLUSION.

Track tanks should, preferably, be located on tangents and where good drainage can be provided, also where good water is abundant, and at sufficient distances from stations and all other facilities which would permit trains attaining a speed of at least 25 miles per hour. Modern power equipment is capable of hauling an enormous tonnage, and the tendency is to still further increase the size and capacity of locomotives. Therefore, in order to avoid the necessity of unreasonably increasing the water tank capacity of engines, the distance between trough stations should not exceed 40 miles, unless other controlling conditions require it.

The design of the power plant required cannot be outlined in detail for standardization, because this depends much on local conditions. Boiler capacity of 100 h. p. will, in general, heat about 7,000 sq. ft. of water surface in troughs, by means of direct heating system, sufficiently to prevent the water from freezing during the most severe weather encountered on the New York Central Lines. Accordingly, four standard troughs, as recommended, would require about 220 h. p. of boiler capacity for heating purposes.

Duplicate pumps should be installed to insure continuous service. The capacity of each pump should, in general, be about double the average hourly consumption of the plant. A boiler capacity of from 40 to 80 h. p. will be required for pumping. Pumping may be dispensed with when a good supply of water can be obtained by gravity. Sometimes the water is obtained from deep wells and can be most advantageously elevated into the storage tanks by means of the air lift, compressors in this case replacing the pumps. Usually water from deep wells is comparatively warm, so that, if scooping is frequent, very little heat is required to prevent freezing.

Some scoops are very inefficient, and it would seem reasonable to expect that the best could be improved. The design of the scoop used on the Lake Shore & Michigan Southern appears to be the best of any used on the New York Central Lines. Any improvement in the efficiency of the scoop not only reduces the cost of operating the plant and the cost of maintaining the roadbed, but is equivalent to increasing the capacity of the track tanks. There also appears to be a greater opportunity to economize in this way than in any other in connection with the operation of troughs. It is, therefore, recommended that the design of the scoops be given further consideration.

RECOMMENDATIONS FOR STANDARD PRACTICE.

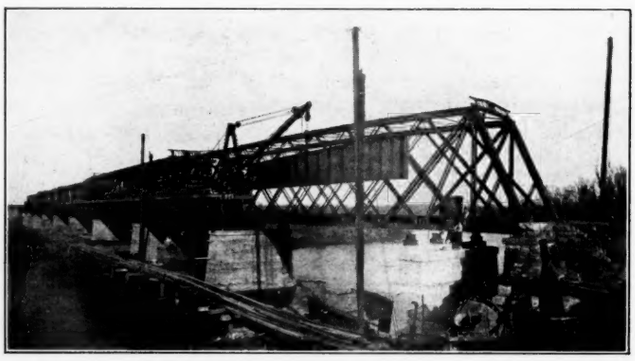
The trough should be 2,000 ft. long, 7 in. deep, and having a width that will provide an inside clearance of 19 in. It should consist of two standard 7 in., 9.75-lbs. channels, with flanges turned in to form the sides and a flat plate ¼ in. thick and 23¼ in. wide, riveted to one flange of each channel, to form the bottom. The ties should be dapped 2¼ in. to receive the trough. This can be done safely and is sufficient to maintain the top edges of the trough below the top of the usual 100-lbs. rail, when the trough has become somewhat uneven, as it always does after it has been in service for a time.

The end sections should be constructed with the bottom plate inclined at an angle so that the length of incline will be 10 ft. The plate should be ½ in. thick and secured to the side channels by angles riveted to each. The beginning of the incline where the scoop would first hit should be backed by an iron wedge and the balance backed by hardwood.

The direct heating system is advised. Since the headway of trains is being considerably reduced, five inlets to each trough should be provided in order that it may be refilled quickly enough. Five inlets in connection with the circulatory system would render the cost of installation excessive.

AN INTERESTING METHOD OF BRIDGE RENEWAL.

The Chicago, Rock Island & Pacific replaced a single track through truss bridge over the Cedar river near Moscow, Iowa, with a double-track deck plate girder structure during last season, without interruption to traffic and without the use of any falsework for supporting the superstructure. This bridge is on the main line from Chicago to Omaha, which has been double-tracked for several years as far as Iowa City, Iowa, with the



Erecting Down Stream Line of Girders.

exception of this bridge. Traffic on this portion of the line is so heavy that delays at the bridge have been frequent and the necessity for adding the second track had become very urgent. The old structure was not designed for present loadings and in considering the plans for double-tracking, it was thought advisable to replace it with one of heavier design. It is interesting to note that the new bridge is the fourth at this location, the three previous structures having each been in service for 20 years. The first bridge was built in 1852, being a wooden truss structure. It was replaced by an iron bridge in 1872, and that in

Building Substructure for New Deck Girder Structure.

turn by a steel truss bridge which has now been removed after 20 years' service.

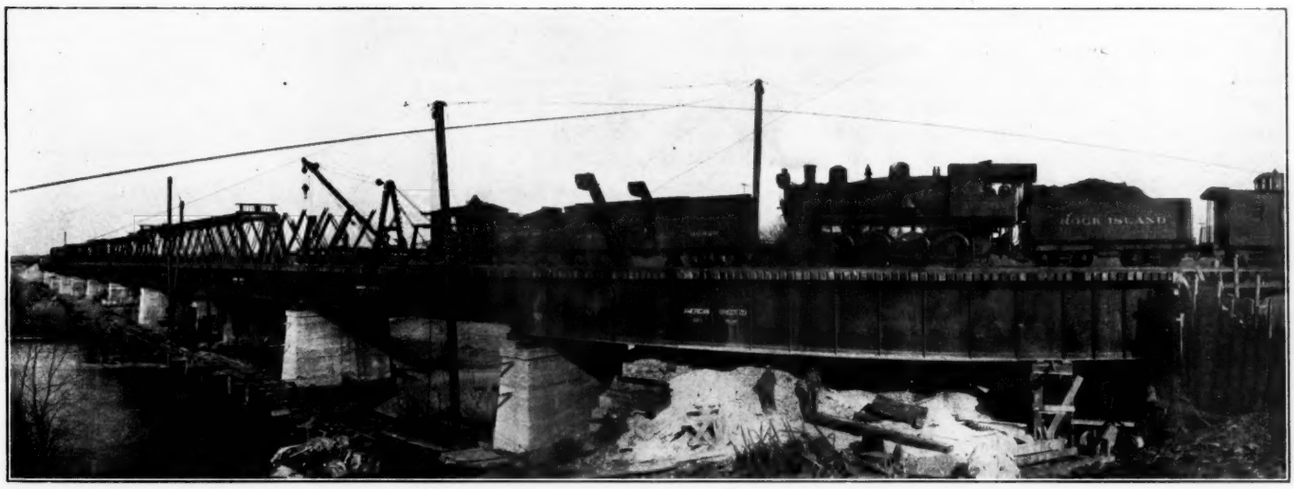
The old bridge consisted of five latticed through trusses of the following lengths starting from the west end: 150 ft. 11⅞ in., 155 ft. 8¾ in., 156 ft. 7⅛ in., 174 ft. 11⅞ in., and 155 ft. 5¼ in. As the old stone piers remodeled in 1892 were still in good condition, it was possible to use them as part of the substructure of the new bridge, and as the river is shallow at this point and the foundations comparatively good, it was decided to shorten the span lengths by building intermediate concrete piers between

the old ones in order to use deck plate girders for the superstructure. It was desired to lengthen the bridge somewhat at the east end so that a new abutment had to be built, and as the span lengths could not be economically adjusted to use the easterly pier, the one abutment and the adjacent pier were removed and one 90 ft. and four 77 ft. 9 in. girders resting on the new abutment and four new piers were used to replace the easterly two truss spans. The next two spans were replaced by four 77 ft. 9 in. girders and the remaining span by two 75 ft. girders. The west abutment and the three old piers that are used in the new structure had to be remodeled and extended to carry the double-track, and seven new concrete piers and one new abutment were built. These new piers and the abutment required 4,500 cu. yd. of concrete. The piers are carried down from 7 to 15 ft. below the bed of the stream, far enough in all cases to place the footings a sufficient distance below the top of the bed of blue clay to prevent damage from scour. The footings are supported on piling in all cases. The piers are from 30 to 35 ft. high, the difference in elevation between high and low water being about 15 ft.

The alinement of the present single track was adopted for the new westbound track, the second track being added on the down stream side of the structure. In order to keep traffic moving during the reconstruction of the bridge, the old structure was retained in service and operated as a gauntlet track during the building of the piers and the erection of the girders under the new down stream track. The traffic was then turned over this track, which was operated as a single track, while the old trusses were dismantled and the new girders erected for the westbound track. The substitution of a deck structure for a through, made necessary a raise in grade of nearly 6 ft. in order to use the same piers. The approach fill for this higher level was made on the eastbound track by temporarily moving the old trusses nearly 3 ft. up stream and the location of the new second track about the same distance down stream. This gave a distance between track centers of about 18 ft., which allowed the fill to be made for the new approach without blocking the operated line. The length of this approach was kept as short as possible by using a very steep runoff. The girders for the down stream track were placed by a derrick car working along that track, beginning at the west end. When this line of girders was completely erected and the approach at the east end connected up, traffic was turned over this track during the dismantling of the old truss and the erection of the new girders for the up stream track.

This replacement of through trusses by deck girders was handled by a method developed during the previous season for a similar bridge over the Iowa river near Columbus Junction, Iowa. (See *Railway Age Gazette*, January 19, 1912.) Beginning at the east end, as many rivets as could be spared from the floor system of the truss were cut out in advance. Two steel beams with steel pins from which block and tackle could be suspended, were then placed across the top chords of the old trusses near the ends of the girders to be placed. The girder span was riveted up and brought out to place on two flat cars which were spotted directly above the final location. The block and tackle from the overhead beams were hooked to the ends of the girders, the lines from these blocks were attached to a flat car next to the engine, which then moved slowly forward, lifting the span clear of the cars. The cars were pushed out of the way, and while the girders were held suspended by the engine, the floor system of the old bridge was removed so that the girder span could be lowered into place by the engine. After the placing of the girders, the derrick car dismantled the old trusses, working from the east end. The accompanying photographs show the three stages of the work, the first near the beginning of the construction of the new piers, the second near the end of the construction of the down stream track, and the third beginning to dismantle the old trusses after the erection of both lines of girders. About 700 tons of old steel were removed, and about 1,015 tons of new steel placed.

This work was handled under the general direction of J. B. Berry, at that time chief engineer of the Chicago, Rock Island & Pacific, and since made assistant to the president. I. L. Simmons, bridge engineer, had charge of the design and erection, and C. E. Ziegenbein handled the field work. The Cedar Rapids Construction Company had the contract for the substructure; the American Bridge Company fabricated the superstructure, and the erection was done by company forces.



Dismantling Old Trusses After Completion of Erection of New Girders.

THE FOREMAN PROBLEM.*

By James Ryan,
Supervisor, Chicago & Eastern Illinois, Villa Grove, Ill.

The prevalent idea that when a man is a track laborer he is down about as far as he can get and takes that work as the last resort, should be dispelled. The best place to attract native labor to the track is on the sections outside of terminals, and the inducements needed are good wages and steady work. Men should be picked from such places because at the terminals the men are always looking to the better positions in the transportation or mechanical departments, and it is generally necessary to hire foreigners as common laborers.

To keep a supply of foremen one man should be picked on

*Received in the contest on The Foreman Problem, which closed March 25, 1912.

each section and paid about 25 cents more per day than the laborers. These men in the absence of the foremen should make all reports, keep the books and take charge of the work. Put these men in extra gangs as assistant foremen to familiarize them with handling large numbers of men on construction work; give them a few months as time-keepers and then about six months in the busiest yard. When placing them on sections, put them where they join old experienced foremen so that in doubling up sections experienced foremen will always be present and the new men can learn from them.

Native labor should always be paid more than foreign, and the companies should be careful to avoid the native laborers getting the idea that foreign laborers are better paid and often furnished fuel and house of some sort. When other departments are increased, do the same with the trackmen, and you will have more satisfied men. The further education of foremen should be accomplished by having them in every three months to explain the work and reports to them. In sections of the country where native labor is scarce the foremen should be paid higher in order to get English speaking men if at all possible.

PROTECTION OF MEN IN THE MAINTENANCE OF WAY DEPARTMENT.*

By B. A. West,

Roadmaster, Atchison, Topeka & Santa Fe, Pueblo, Colo.

We have what is known as a "Safety Habit" organization on the Santa Fe, with local organizations on each division, with representation from the maintenance of way department. At this time the largest percentage of our track laborers are of foreign birth, which is accountable, to a large extent, for the large proportion of personal injuries to our employees. With this class of labor, no amount of experience or foresight on the part of the foreman or roadmaster will entirely prevent accidents, but this condition calls for intelligence, coolness and eternal vigilance on the part of the supervising officers and foremen.

In selecting foremen for work trains or extra gangs, I endeavor to secure those whom I know to be competent, careful and fully aware of the responsibilities which are attached to these positions. In this country they must have a knowledge of the Spanish language, must know how to handle men and be able to instruct them how to use the various tools. They must carefully inspect tools and cars to discover and remove any defective material. The foremen, as well as the roadmaster, must make it a practice to show new men the proper way to handle the tools, and especially how to place and drive spikes, as an inexperienced or careless spiker is almost as dangerous as a machine gun in a crowd of men. Whenever one has to use inexperienced men as spikers, they should be placed by themselves where there is no danger of flying spikes hitting other men.

While it is a difficult matter to handle men who do not understand our language, and probably do not comprehend a word one says, much can be accomplished by being patient and persevering and giving many object lessons. A foreman who has no sympathy for the man who does not speak "United States," and cares little whether these men are crippled or not, should be promptly discharged.

Among the most common forms of carelessness are running hand cars in foggy weather or at night, going through deep cuts on curves, and crossing long trestles where the view is obstructed, without flagging; overloading hand cars with men or running them at too high speeds, etc. In handling rail or other heavy material, it is advisable not to allow talking by other than the foreman. Whenever it becomes necessary to send out a red flag, a man should be sent who can speak English, or if there are none such in the gang, the man sent should carry a note from the foreman telling the nature of the obstruction and where it is to be found. Each engineman stopped by this flagman should be required to sign the note before proceeding.

In operating hand cars I have found it advisable to limit the number of men on one car to 10, including the foreman, and one man should always ride backwards in order to watch for trains coming from the rear. Racing should never be permitted, and where there is more than one car they should be run at least 200 ft. apart.

Track jacks should never be placed on the inside of the rail and they should always be set vertically to avoid throwing the track out of line. The man operating the jack should be fully instructed regarding its working, so that it can be removed quickly if necessary.

All material, tools, hand cars, etc., should be placed far enough from the track so that they will not be struck by passing trains. In this country, with almost continual winds, it is necessary to exercise great care to keep frogs, switches, guard rails and flangeways at crossings free from drifting sand and debris, for frequently accidents result from lack of attention here.

Work about steam shovels is dangerous at best, and especially so if blasting has to be resorted to. The foreman, as well as the train and enginemen must be very careful to avoid injury to laborers for the risks from an unexploded shot, from material falling, and from working about trains is great.

The maintenance of way employee is subject to special risks when working about wrecks. At such times he must go regardless of weather conditions and remain until the line is open for traffic. A foreman should be very careful never to send a man to work under or around cars unless they are well blocked to prevent their overturning upon him. It is also essential that the work is well lighted at night to prevent the men stumbling over objects in their way. The most intelligent men should be used in more dangerous places because of their ability to comprehend the danger and to avoid too great risks.

In handling outfit cars for extra gangs I have found it advisable, where possible, to place these cars on tracks that are not used or to spur them out. All bunk and commissary cars should open from the side opposite the main line or passing tracks so that there will be no danger of train employees falling over steps or rubbish at the camps. In this way the cars will also present a neater appearance from the main line. Where cars are liable to be moved at any time, men should not be allowed to sleep under them or to make swinging beds on the truss rods. No wood or other material should be allowed to be stored under the cars where it might fall onto the track during the movement of the cars.

*Received in the Safety contest which closed October 25, 1912.

COMBINED SIGNAL AND TRACK MAINTENANCE.

The Chicago & Alton has just combined the maintenance of track and automatic signals on 30 miles of its heavy traffic main line between Bloomington, Ill., and Odell. In this experimental plan the position of the signal maintainer who in the present organization has supervision over the signals on about 15 miles of line, is abolished and the work divided between the section foremen on the individual sections. The division supervisor of signals will continue to have the same duties as formerly, and will instruct the section foremen in all details relating to the maintenance of signals. The pay of the section foremen has been raised from $60 to $70 per month, and it is expected that in this way a better class of section foremen will be obtained, while at the same time, the performance of the signals will be improved, owing to the concentration of all duties affecting them under one foreman.

CLASSIFICATION OF SECOND HAND RAIL.

Outline of Method Used for Grading and Handling the Many Weights and Patterns of Relaying Rail on a Large System.

By Jay See.

The economical distribution and handling of second-hand rail on large systems is a matter that requires close attention, and presents an opportunity for much waste or saving. The rail question has been very prominent for the past few years, the glare of talent, however, being focused upon the material until it is purchased and in service. The inspection and distribution of rail released in relaying is left to the judgment of men in subordinate positions on many railroads. It is to the handling of this rail that the following pertains:

Most large railroad systems have resulted from the combination of small independent lines, by virtue of which there have resulted properties, with a variety of standards for buildings, bridges and track materials. With the demands of increased business, many buildings and bridges are found to be inadequate, and are then replaced by others of the adopted standard for the larger system, the salvage in either case being of comparatively little value, as the materials recovered are seldom used again in the same sort of construction. With rail, however, the conditions are somewhat different. When the requirements of service demand heavier steel, the lighter rail released in relaying is transferred to secondary main and branch lines, is used to repair rail of the same weight still in service, or, is used for passing and industry tracks, and it is repeatedly transferred and relaid until it is only fit for scrap.

On many railroads 15 to 20 different rail sections are now maintained, and the reduction of the number of these various sections to two or three adopted standards is a gradual and slow process. Such plans are being rapidly followed, however, permitting a smaller stock to be carried on hand for repairs and renewals. The section of rail that it is desired to discontinue must be maintained in branch and yard service until it is worn out and frogs and switches used in such lines are, in many cases, manufactured from such rail released from track, this being the only source from which suitable rail can be obtained. Railroads also purchase the standard A. S. C. E. or A. R. A. sections that correspond very closely to the obsolete sections in their tracks. This rail is also sometimes used for the manufacture of frogs and of switches, which makes the reclaiming of the obsolete rail for the purpose unnecessary.

The necessity for establishing a standard for the classifying and grading of rail released in relaying is apparent on most railroads. By so doing they get the maximum service there is in the rail, and a service that uses and disposes of the rail to the very best advantage.

More or less loss and delay is experienced on account of the shipping of rail unsuitable for the purpose for which it is to be used, from one end of the system to the other. This rail is usually inspected and graded by division roadmasters, but more frequently by some of their men. In shipping rail to the "other fellow," or, off their territory, the division men generally do not give it as close inspection as if it were intended for their own use. Sometimes they intentionally "unload" on other divisions, particularly if they are a long distance away.

It is also found that there are as many different ideas as to what constitutes a number one rail as there are roadmasters. In order to avoid such difficulties as these one of the larger western railroads has rail inspectors that inspect all second-hand rail recovered in relaying. These men are sent out from the office of the engineer of maintenance of way and assist the division men in inspecting, classifying and recording all rail released in relaying, thus securing more uniform rail classification. The following instructions are the basis on which this rail is inspected:

RULES FOR CLASSIFYING AND INSPECTING SECOND-HAND RAIL.

A second-hand rail is any rail irrespective of grade or quality that has been used in track.

All rail released by relaying will be classified and marked, according to the grade, in one of the following seven classifications:

Number one—marked by one strip	1
Number one saw—marked by one strip and dash	1—
Number two—marked by two strips	11
Number three—marked by three strips	111
Number three saw—marked by three strips and dash	111—
Scrap—marked by cross	×
Reclamation rail—marked by circle	O

Number one rail is second-hand rail suitable for renewals in main tracks; also rail that can be used for the manufacture of frogs, switches, etc. Number one rail must be 24 ft. or over in length for use in main lines. Calipered rail from the rail saw will grade as number one.

Number one saw rail is second-hand rail which, after sawing, will produce a number one rail as outlined above. Generally the only defect is that of batter.

Number two rail is second-hand rail suitable for renewals and repairs in passing tracks, thoroughfare tracks in yards and other similar tracks. It is usually physically defective rail, although serviceable. Number two rail must be 18 ft. or over for use in passing tracks.

Number three rail is second-hand rail suitable for use in industry and storage tracks, less important yard tracks, mine spurs and tracks that engines do not frequent.

Number three saw rail is second-hand rail that requires drilling, sawing or other labor before it can be used in track—generally the result of broken rails. Number three saw rail will produce, after sawing, number one or number two rail.

Scrap rail is second-hand rail which it is impracticable to use again in track on account of its physical condition.

Reclamation rail is rail that has failed on account of some physical defect within the period of five years from the date of the brand on the rail.

All rail under 15 ft. in length, regardless of grade or quality, is considered scrap and should be so classified. This rail is so classified on account of a ruling of the auditor.

Number one rail may be any length over 24 ft. It must be of sound steel, free from physical defects, straight as to line and surface, full drilled and in shape for repairs or renewals in main tracks. Number one rail shall not have a top surface wear of over 1/16 in., or a side surface wear of over 3/32 in.; measurements to be made at the center of the surface considered. It shall not have a batter of over 1/32 in.

Number one saw rail is rail that is defective only as to batter, and which after sawing will produce a number one rail, as outlined above.

Number two rail is so classified for the following causes and defects: wear on any surface of over 3/32 in., measurement to be made at the center of the surface considered; rail thrown out of line mechanically by the use of a Jim Crow or rail bender; rail that has been used on curves of such a degree that necessitates their being curved before use; rail badly pitted, burnt or with any perceptible head flaw; rail with slight metal flaw, but not ragged or saw edged; rail line and surface bent, but still usable; rail, flange broken, with only one piece broken from the base, such piece to be not over 30 in. in length, or nearer than 36 in. to the end of the rail; rail battered, the end

showing no other defect; batter limited to ¼ in. in excess of top wear; rail broken, but spliced with angle bars. The short pieces must be over ten ft. in length; rail curve worn to such an extent that it cannot again be used for main line repairs; limit of wear ten per cent. of area of head.

Number three rail is so classified for the following causes and defects: Rail badly curve worn when wear of ball exceeds ten per cent. of area of head; rail that has a ball wear on side of ball of ¾ in. and top wear ⅜ in.; rail with excessive metal flaw, ragged; rail with base broken in more than one place; rail with batter exceeding ¼ in. and which would produce, by being sawed, a number two rail; any rail that can be used without additional labor for sawing and drilling, but which would otherwise be scrap.

Number three saw rail is so classified for the following causes and defects: Rail full length, damaged, line or surface bent, from which can be recovered by sawing a number one or two rail full length for track use, or a piece of steel six ft. in length or over, to be used for the manufacture of frogs and switches; broken base rails with over one piece broken from base, but from which there can be recovered by sawing a number one or two rail over 15 ft. in length; rail battered ¼ in. or more at end; split end or split head rail, where observed conditions are not such as would indicate defective steel throughout the entire

View of Rail Yard.

rail; rail that has any defect that would prevent its use in track, but from which, after being sawed and drilled, there can be recovered a number one or two rail over 15 ft. in length.

Scrap rail includes all rail less than 15 ft. in length regardless of quality. It is rail so physically defective that it cannot be classified in any of the grades above outlined.

All rail must be inspected before and after relaying; before it is marked or finally classified.

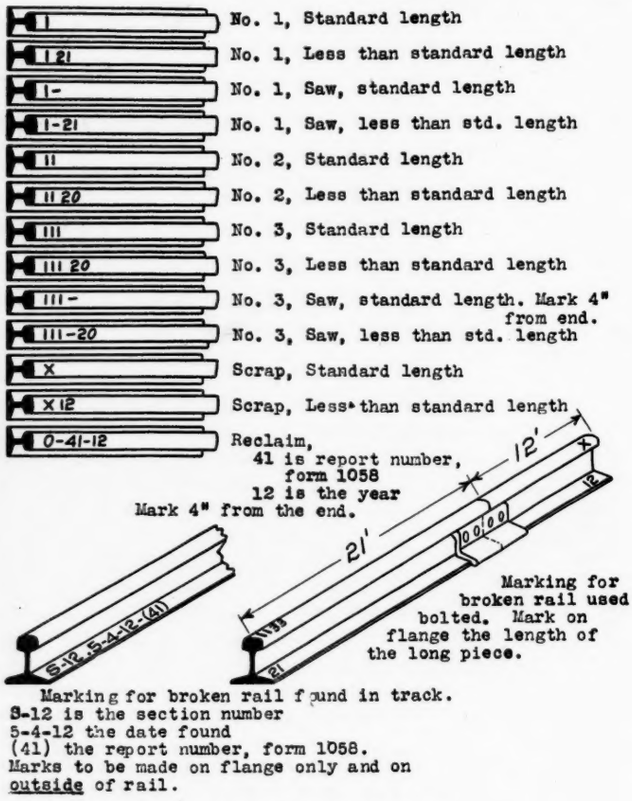
On the preliminary or first inspection made before the relaying begins rail inspectors must observe the condition of the rail as to curve, side and top wear, batter, head flaws and condition of line and surface. Only such rail as will grade number one is to be marked at this time; marking to be done by crayon on the gauge side of the web near the end of the rail. A preliminary report of the first inspection must be sent to the engineer maintenance of way in order that he may be advised as to probable amount of suitable relaying rail that will be recovered.

On the final inspection, after the rail has been released from track, the rail inspector must personally inspect the base of all rail which, on first inspection, was classified as number one, and know that such rail is physically sound steel. At this inspection all rail is to be finally marked on the ball with white paint. On all rail less than the standard length of 30 or 33 ft., according to the weight, the length shall be marked on the ball in addition to the classification marking; standard marking to be as shown on the accompanying chart.

Reclamation rail is rail that shows physical defects on final inspection. It can only be so classified when the relaying is done within a period of five years from the date of the brand on the rail. Such rails are to be marked and reported consecutively—the reports and rail numbers to correspond. On the ball of this rail should also be marked the month and year found.

Rail that is to be transported from any job of relaying to another territory and there relaid in the same position that it originally occupied in track will be called "pedigreed" rail. Inspectors will mark the line rail on the ball, with consecutive odd numbers; the gage rail with the even numbers, marking the number on each end of each rail. "Pedigreed" rail must receive the same final inspection as number one rail; to insure its being physically sound.

Inspectors will be furnished with a copy of the estimated amount of relaying to be done. They must keep an accurate



Methods of Marking Rail.

record of all rail released from any relaying they inspect; this record to show the grade and class of rail recovered. Final reports are to be sent to the engineer maintenance of way and division superintendent, showing accurately the amount of rail of each classification.

The rail inspectors will be supplied with calipers, straight edge, tallies, wedges, etc., as may be necessary. On preliminary inspection five track miles, and on final inspection, two track miles of rail will be considered a day's work. Accuracy is to be given preference at all times.

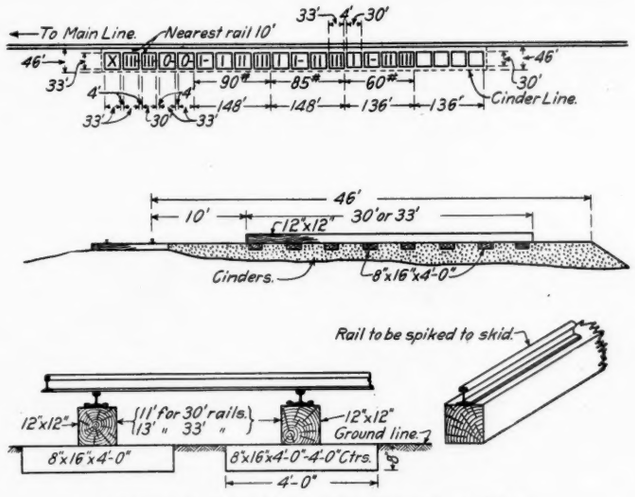
Without some standard system of rail classification, the inspection of rail released will be more or less superficial, ball inspection being the usual limit. This naturally allows many dangerous and defective rails to find their way again into main line track and has been known to result in serious derailments. It is also impossible to properly grade rail in any other way. Oftentimes a division officer will classify rail improperly and ship the wrong rail from his division, resulting in considerable loss for

handling and hauling it a considerable distance, before finding that it is unfit to use for the purpose intended. Cases are known where as a small job of relaying was being done the roadmaster would select good rail released, and use it "up the line" to repair rail of the same weight, releasing a poor grade of rail, and shipping it to some order he was holding. By the above system of inspection this is avoided and rail is of the same grade over the entire system.

A rail yard was built on each division, generally at headquarters, in which is stored all rail recovered from repairs and relaying, except that which is sent to the saw or the scrap, which is sent to the general storehouse. These yards are built at some permanent location, and each weight and class of rail is piled separately.

All sets of skids are given pile numbers, beginning with pile No. 1 for scrap. All rails are piled flush, the same end of all rails on all piles being marked; that is all marking of each pile is at the same end, and all piles in the yard are marked at the same end. Rails are not "balled in." No. 3 saw rail may be mixed in piling, but all other rail is kept separate.

The reclamation rail is piled separately only one tier high, and in consecutive order, according to reported failure. The number three saw rail is piled separately as to classification only, no effort being made to keep separate the various weights. All rail that is to be sawed is generally sent to the rail saw at once.



Layout of Rail Yard with Details of Skids.

The division superintendent makes a monthly report of the rail on hand available for shipment, showing the weight and grade. Its disposition is handled by the engineer maintenance of way, who orders it from one division to another, or for use on the division, as required. He has in his possession, at all times, the information as to the grade of rail available, so that he can dispose of it to the best advantage. By having these rail yards located on each division much of the rail recovered in relaying, which is to be used on that division, can be stored there with a minimum haul until it is required for A. F. E. work.

The usual allowance of one rail every track mile for main line, and one rail every odd track mile for branch lines and yards is all the "inactive stock" that is held on the various divisions. All other rail on the division is shown "available for shipment," either at division rail yards or at the saw mill yard, giving resource to the maximum amount of repair material.

In traveling over almost any railroad one can observe more or less rail distributed along the line, and at section tool houses. The amount of money invested in this one track supply alone is indeed large. Section foreman sometimes "like the crow" hide the material for "future use" which, in the majority of cases, never occurs.

The scheme for the handling and inspection of rail, as outlined above, is very simple, but must be followed closely. Its simplicity may commend it. This plan, however, was not produced on first trial, but is the result of experience and trials.

The reasons for its application are that it allows an easy and accurate invoice by auditors; assures physically sound rail for relaying and repairs on main lines; classifies all rail so that the best distribution can be made according to the use for which the rail is required; keeps all rail at headquarters as "active stock," available for use at all times; permits grading the rail the same the system over; and reduces the haul of a large amount of rail off the division until it is assigned to some particular work.

"SAFETY FIRST."*

By E. B. Fithian,
General Roadmaster, Missouri Pacific, Little Rock, Ark.

Very few railway men who have given thought to the injuries that occur to maintenance of way employees will take exception to the statement that at least 50 per cent. and possibly 70 per cent. of such injuries are due either to the carelessness of the employees themselves, or to the improper supervision of the foreman directly in charge of the men, who does not observe closely the action of his men and enforce the rules of common sense and of the company. This condition particularly exists in the south where a large per cent. of the section laborers are negroes, and who, unfortunately, do not receive the consideration that they should at the hands of their foremen.

The remedy is to make the laborers and foremen realize the tremendous number of maintenance of way employees injured and then impress them with the fact that their own self-preservation depends on the observation of the rules of the company, and of common sense. The laborers who are constantly changing and of various nationalities, are hard to interest in the subject, and it requires time and persistent effort to attain the object desired. They have to be reached through the foreman and this means that the efforts should be concentrated on him.

The foremen, as a rule, are men who have been in the service for years. Most of them can be readily interested in any subject that will advance the interest of themselves and the company. They are particularly loyal to their roadmaster or supervisor, and will be constantly on the alert to make the subdivision on which they are located, the banner subdivision. The best way to interest foremen is collectively, and a meeting once in two months, or possibly oftener, at some convenient point, will bring out ideas and stir up a rivalry that will result in untold benefit to all concerned.

A careful record should be kept of the number of injuries in each gang of section men and carpenters, with the cause of the injury. This record should be bulletined each month and issued before the meeting of the foremen, so as to bring out the discussions. Where foreigners are employed to any extent, these reports or bulletins should be written in languages that can be read by all the laborers. There is no better place to post a report than on a bulletin board, protected if necessary, outside of the tool house where the laborers are sure to have time and sufficient light to read it.

Finally, we should not overlook the necessity of providing the very best sanitary conditions in connection with our camps. The greatest enemy that the soldier has to meet and conquer is sickness resulting from unsanitary conditions of the camps. Similar conditions at times surround our camp outfits and too often these are overlooked. The roadmaster and foremen should take a particular interest in each individual camp, arousing in some way a rivalry among the camps, to have each outdo the others to win some praise or comment from superior officers as one of the best camps. This condition can probably be best secured if closer supervision of the camps is given by the division officers and surgeon, with periodical inspections, without notice when the inspections are to be made.

*Received in the Safety contest, which closed October 25, 1912.

1913 A. R. E. A. COMMITTEE ASSIGNMENTS.

Complete List with Names of Members Appointed and Subjects Assigned for Investigation and Report This Year.

The new committees selected by the Board of Direction of the American Railway Engineering Association, together with the subjects assigned to the various committees for study during this year are as follows:

COMMITTEE I.—ROADWAY.

1. Report on and recommend unit pressures allowable on roadbed of different materials, conferring with Committee on Ballast.
2. Report on tunnel construction and ventilation.
3. Economics in roadway labor.

W. M. Dawley, Erie, chairman; J. A. Spielmann, B. & O., vice-chairman; Ward Crosby, C. C. & O.; W. C. Curd, M. P.; Paul Didier, B. & O.; R. C. Falconer, Erie; S. B. Fisher, M. K. & T.; Frank Merritt, G. C. & S. F.; F. M. Patterson, C. B. & Q.; W. D. Pence, Univ. of Wisconsin; A. C. Prime, P. R. R.; M. J. Corrigan, B. & O.; H. J. Slifer, Cons. Eng.; J. E. Willoughby, Caribbean Constr. Co.; W. P. Wiltsee, N. & W.; L. M. Perkins, N. P.; E. G. Ericson, P. L. W.; L. G. Morphy, B. & A.; W. H. Petersen, C. R. I. & P.

COMMITTEE II.—BALLAST.

1. Further investigation of proper depth of ballast of various kinds to insure uniform distribution of loads on roadway, conferring with Roadway Committee.
2. Revise ballast sections with particular reference to the use of a sub- and top ballast.
3. Investigate methods of cleaning stone ballast and obtain cost of same by various methods.

H. E. Hale, M. P., chairman; J. M. Meade, A. T. & S. F., vice-chairman; L. W. Baldwin, I. C.; D. P. Beach, P. L. W.; W. J. Bergen, N. Y. C. & St. L.; A. F. Blaess, I. C.; T. C. Burpee, Intercolonial; O. H. Crittenden, I. & G. N.; F. T. Darrow, C. B. & Q.; J. M. Egan, I. C.; T. W. Fatherson, C. R. I. & P.; H. L. Gordon, B. & O.; G. H. Harris, M. C.; C. C. Hill, M. C.; S. A. Jordan, B. & O.; William McNab, G. T.; A. S. More, C. C. C. & St. L.; J. V. Neubert, N. Y. C. & H. R.; S. B. Rice, R. F. & P.; E. V. Smith, B. & O.; F. J. Stimson, G. R. & I.; S. N. Williams, Cornell College.

COMMITTEE III.—TIES.

1. Report on the effect of design of tie-plates and track spikes on durability of ties.
2. Continue study of the stresses to which cross-ties are subjected, and determine size required.
3. Report on economy in labor and material effected through use of treated ties compared with untreated ties.

L. A. Downs, I. C., chairman; G. W. Merrell, N. & W., vice-chairman; H. W. Brown, P. L. W.; W. J. Burton, M. P.; E. D. Jackson, B. & O.; H. C. Landon, Watauga & Yadkin River; F. R. Layng, B. & L. E.; E. R. Lewis, D. S. S. & A.; R. J. Parker, A. T. & S. F.; J. G. Shillinger, Rutland; G. D. Swingly, B. & O.; D. W. Thrower, I. C.; H. S. Wilgus, P. S. & N.; Louis Yager, N. P.; E. C. Young, N. Y. P. & N.; A. M. Acheson, M. K. & T.; C. C. Albright, Purdue Univ.; O. P. Allee, Fort Smith & Van Buren; S. B. Clement, Temiskaming & Northern Ontario.

COMMITTEE V.—TRACK.

1. Continue study of main line turnouts and crossovers.
2. Report on the economics of track labor.
3. Study the relation between worn flanges and worn switch points, with a view to correcting the cause and decreasing the number of derailments due to the combination of a worn switch point and worn flanges on wheels.

J. B. Jenkins, B. & O., chairman; G. J. Ray, D. L. & W., vice-chairman; Geo. H. Bremner, C. B. & Q.; Garrett Davis, C. R. I. & P.; J. M. R. Fairbairn, C. P. R.; T. H. Hickey, M. C.; E. T. Howson, *Railway Age Gazette;* J. R. Leighty, M. P.; C. Millard, C. G. W.; P. C. Newbegin, Bangor & Aroostook; H. T. Porter, B. & L. E.; W. G. Raymond, State Univ. Iowa; S. S. Roberts, Cons. Eng.; L. S. Rose, C. C. C. & St. L.; H. R. Safford, G. T. R.; C. H. Stein, C. R. R. of N. J.; F. S. Stevens, P. & R.; H. M. Church, B. & O.; L. J. F. Hughes, C. R. I. & P.; A. H. Stone, K. C. T.; E. Raymond, A. T. & S. F.; F. B. Oren, I. C.; Raffe Emerson, Cons. Eng.

COMMITTEE VI.—BUILDINGS.

1. Present principles covering design of inbound and outbound freight houses.
2. Report on the advantages and disadvantages of the various designs of freight houses and shop floors.
3. Report on methods of heating, lighting and sanitary provisions for medium sized stations.

Maurice Coburn, Vandalia, chairman; M. A. Long, B. & O., vice-chairman; G. W. Andrews, B. & O.; J. P. Canty, B. & M.; D. R. Collin, N. Y. C. & H. R.; C. G. Delo, C. G. W.; C. H. Fake, M. R. & B. T.; C. F. W. Felt, A. T. & S. F.; G. H. Gilbert, Q. & C.; A. T. Hawk, C. R. I. & P.; H. A. Lloyd, Erie; W. S. Thompson, P. R. R.; O. P. Chamberlain, C. & I. W.; P. B. Roberts, G. T. R.

COMMITTEE VII.—WOODEN BRIDGES AND TRESTLES.

1. Complete report on formulae for use in determining the strength of sheet piling.
2. Complete report on the use of guard rails for wooden bridges and trestles.
3. Report on relative economy of repairs and renewals of wooden bridges and trestles.

I. L. Simmons, C. R. I. & P., chairman; W. S. Bouton, B. & O., vice-chairman; H. Austill, Jr., M. & O.; F. E. Bissell, A. C. & Y.; E. A. Frink, S. A. L.; E. A. Hadley, M. P.; H. S. Greenwood, C. N.; A. O. Ridgway, D. & R. G.; H. S. Jacoby, Cornell Univ.; P. B. Motley, C. P. R.; W. H. Hoyt, D. M. & N.; D. W. Smith, H. V.; W. F. Steffens, C. & O.; H. B. Stuart, G. T. R.; F. J. Bachelder, B. & O.; J. E. Barrett, L. & H. R.

COMMITTEE VIII.—MASONRY.

1. Report on waterproofing of masonry and bridge floors, including methods, cost and results, with definite recommendations.
2. Report on the effect of concrete structures of rusting of the reinforcing material.
3. Report on the principles of design of plain and reinforced concrete retaining walls, abutments and trestles.

G. H. Tinker N. Y. C. & St. L., chairman; F. L. Thompson, I. C., vice-chairman; R. Armour, G. T.; C. W. Boynton, Universal Portland Cement Co.; T. L. Condron, Cons. Eng.; J. K. Conner, L. E. & W.; W. A. Clark, D. & I. R.; Frank Taylor, C. P. R.; G. W. Hegel, C. J.; L. J. Hotchkiss; R. L. Humphrey, Cons. Eng.; J. H. Prior, C. M. & St. P.; F. E. Schall, L. V.; G. H. Scribner, Jr., Contr. Eng.; A. N. Talbot, Univ. of Illinois; J. Tuthill, K. C. T.; J. J. Yates, C. R. R. of N. J.; John C. Beye, C. R. I. & P.

COMMITTEE IX.—SIGNS, FENCES AND CROSSINGS.

1. Continue the investigation of ways and means for securing a proper quality of fence wire to resist corrosion and secure durability.
2. Concrete and metal for signs and signals as compared with wood.
3. Concrete and metal as compared with wood for fence posts.

C. H. Stein, C. R. R. of N. J., chairman; G. E. Boyd, D. L. & W., vice-chairman; R. B. Abbott, P. & R.; J. A. Stocker, T. & O. C.; H. E. Billman, M. P.; Maro Johnson, I. C.; E. T. Brown, B. & O.; J. T. Frame, C. G. W.; C. M. James, A. C. L.; L. C. Lawton, A. T. & S. F.; A. C. Copland, C. & O.; F. N. Crowell, P. L. W.; Arthur Crumpton, G. T.; L. E. Haislip, B. & O.; G. L. Moore, L. V.; J. B. Meyers, B. & O.; C. H. Splitstone, Erie; W. F. Strouse, B. & O.; W. D. Williams, Cin. Nor.; B. M. Cheney, C. B. & Q.

COMMITTEE X.—SIGNALS AND INTERLOCKING.

1. Report on economics of labor in signal maintenance.
2. Formulate and submit requisites for switch indicators, including method of conveying information on condition of the block to conductor and engineman.
3. Investigate and report on automatic train control.

Thos. S. Stevens, A. T. & S. F., chairman; C. C. Anthony, P. R. R., vice-chairman; A. H. Rudd, P. R. R.; Azel Ames, Cons. Eng.; H. S. Balliet, N. Y. C. & H. R.; W. B. Causey, C. G. W.; C. A. Christofferson, N. P.; C. E. Denney, L. S. & M. S.; W. J. Eck, Southern; W. H. Elliott, N. Y. C. & H. R.; G. E. Ellis, K. C. T.; M. H. Hovey, Cons. Eng.; A. S. Ingalls, L. S. & M. S.; J. C. Mock, Detroit River Tunnel Co.; F. P. Patenall, B. & O.; J. A. Peabody, C. & N. W.; W. B. Scott, S. P.; Edwin F. Wendt, P. & L. E.

COMMITTEE XI.—RECORDS AND ACCOUNTS.

1. Make a comprehensive study of the forms in the Manual which were adopted a number of years ago, and bring forms up to date.
2. Continue study of the economical management of store supplies.
3. Recommend feasible and useful subdivisions of I. C. C. classification account No. 6, with a view of securing uniformity of labor costs.
4. Study the subject of reports required by National and State Railway Commissions.

M. C. Byers, G. N., chairman; J. H. Milburn, B. & O., vice-chairman; J. M. Brown, C. R. I. & P.; W. A. Christian, C. G. W.; G. J. Graves, A. T. & S. F.; J. D. Hill, L. & N.; Henry Lehn, N. Y. C. & H. R.; O. K. Morgan, C. C. & O.; F. Ringer, M. K. & T.; Guy Scott, P. L. W.; W. S. Danes, Wabash.

COMMITTEE XII.—RULES AND ORGANIZATION.

1. Review rules and instructions heretofore adopted by the association and recommend such changes and additions thereto as may seem desirable.
2. Formulate rules for the guidance of field parties:
   (a) When making preliminary surveys for railroad location.
   (b) When making location surveys.
   (c) When in charge of construction.

J. D. Brooke, B. & O., chairman; F. D. Anthony, D. & H., vice-chairman; J. B. Carothers, B. & O.; S. E. Coombs, N. Y. C. & H. R.; C. Dougherty, Q. & C.; K. Hanger, C. R. I. & P.; E. F. Robinson, B. R.

& P.; Jos. Mullen, C. C. C. & St. L.; B. Herman, Southern; E. T. Reisler, L. V.; R. P. Black, K. & M.; C. E. Lindsay, N. Y. C. & H. R.

COMMITTEE XIII.—WATER SERVICE.

1. Report on the design and relative economy of track pans from an operating standpoint.
2. Report on water treatment and result of study being made of water softeners from an operating standpoint.
3. Report on recent developments in pumping machinery.

J. L. Campbell, E. P. & S. W., chairman; A. F. Dorley, M. P., vice-chairman; C. C. Cook, B. & O.; E. G. Lane, B. & O.; R. H. Gaines, F. C. S.; W. L. Rohbock, W. & L. E.; A. Mordecai, Cons. Eng.; W. A. Parker, St. J. & G. I.; W. S. Lacher, C. M. & St. P.

COMMITTEE XIV.—YARDS AND TERMINALS.

1. Report on typical situation plans of passenger stations, of both through and stub types, with critical analysis of working capacity, and include a review of the different methods of estimating their capacity.
2. Report on developments in the handling of freight by mechanical means.
3. Report on developments in the design and operation of hump yards.
4. Report on track scales.

C. H. Spencer, Washington Term., chairman; E. B. Temple, P. R. R., vice-chairman; W. G. Arn, I. C.; H. Baldwin, C. C. C. & St. L.; G. H. Burgess, D. & H.; A. E. Clift, I. C.; H. T. Douglas, C. & A.; A. C. Everham, K. C. T.; D. B. Johnston, P. L. W.; H. A. Lane, B. & O.; G. P. Johnson, D. T. & I.; L. J. McIntyre, N. P.; B. H. Mann, M. P.; A. Montzheimer, E. J. & E.; L. S. Seddon, S. A. L.; E. E. R. Tratman, *Engineering News;* W. L. Webb, C. M. & St. P.; J. G. Wishart, C. R. I. & P.; R. Ferriday, C. C. C. & St. L.; E. P. Weatherly, K. C. T.; C. C. Wentworth, N. & W.; H. J. Pfeifer, T. R. R. A. St. L.; G. H. Herrold, Department of Public Works, St. Paul, Minn.

COMMITTEE XV.—IRON AND STEEL STRUCTURES.

1. Report on the methods of protection of iron and steel structures against corrosion.
2. Study the design of built-up columns, co-operating with other investigators and committees of other societies.
3. Report on design and length of turntables.
4. Report on the relative economy of various types of movable bridges for varying lengths of spans.

A. J. Himes, N. Y. C. & St. L., chairman; O. E. Selby, C. C. C. & St. L., vice-chairman; J. A. Bohland. G. N.; A. W. Buel, W. M.; Charles Chandler, I. C.; C. L. Crandall, Cornell University; J. E. Crawford, N. & W.; J. E. Greiner, B. & O.; W. H. Moore, N. Y. N. H. & H.; A. F. Reichmann, American Bridge Co.; G. E. Tebbetts, K. C. T.; L. E. Van Hagen, Univ. of Wisconsin; F. C. Dufour, Univ. of Illinois; C. E. Smith, M. P.; I. F. Stern, Cons. Eng.; F. E. Turneaure, Univ. of Wisconsin; A. W. Carpenter, N. Y. C. & H. R.; W. R. Edwards, B. & O.; A. R. Raymer, P. & L. E.; William Michel, H. V.

COMMITTEE XVI.—ECONOMICS OF RAILWAY LOCATION.

1. Continue the study of analyses of operating accounts affected by changes in the physical characteristics of location with special attempt to reach as early as possible some approximate values for gradient, distance, rise and fall, and curvature, in order to assist the field engineer with reference to the questions of relative values of location.

R. N. Begien, B. & O., chairman; C. P. Howard, Cons. Eng., vice-chairman; A. K. Shurtleff, C. R. I. & P.; F. H. Alfred, P. M.; A. C. Dennis; F. W. Green, L. & A.; P. M. La Bach, C. R. I. & P.; F. W. Smith, C. C. C. & St. L.; H. J. Simmons, E. P. & S. W.; W. L. Webb, Cons. Eng.; M. A. Zook, Cons. Eng.; J. F. Burns, L. & N.; E. C. Schmidt, Univ. of Illinois; L. C. Hartley, C. & E. I.; J. G. Sullivan, C. P. R.; C. W. P. Ramsey, C. P. R.; J. deN. Macomb, A. T. & S. F.

COMMITTEE XVII.—WOOD PRESERVATION.

1. Continue investigations of the merits as a preservative of oil from water gas and the use of refined coal tar in creosote oil.
2. Continue the compilation of available information from service tests.
3. Continue the investigation of the proper grouping of the different timbers for antiseptic treatment, conferring with Committee on Grading of Lumber.
4. Report on methods of accurately determining the absorption of creosote oil.

Earl Stimson, B. & O., chairman; E. H. Bowser, I. C., vice-chairman; H. B. Dick, B. & O. S. W.; C. F. Ford, C. R. I. & P.; V. K. Hendricks, St. L. & S. F.; G. E. Rex, A. T. & S. F.; C. M. Taylor, P. & R.; Dr. Hermann von Schrenk, Cons. Eng.; T. G. Townsend, Southern; Jos. O. Osgood, C. R. R. of N. J.

COMMITTEE XVIII.—ELECTRICITY.

1. Continue the consideration of the subject of clearances.
2. Report on the effect of electrolytic action on metallic structures and the best means of preventing it.
3. Continue the preparation of a standard specification for overhead transmission line crossings.
4. Continue the investigation on electrolysis and insulation.
5. Report on maintenance organization with relation to track structures.

Geo. W. Kittredge, N. Y. C. & H. R., chairman; J. B. Austin, Long Island, vice-chairman; D. J. Brumley, I. C.; R. D. Coombs, Cons. Eng.; A. O. Cunningham, Wabash; L. C. Fritch, C. G. W.; George Gibbs, Long Island; G. A. Harwood, N. Y. C. & H. R.; E. B. Katte, N. Y. C. & H. R.; C. E. Lindsay, N. Y. C. & H. R.; W. S. Murray, N. Y. N. H. & H.; A. F. Robinson, A. T. & S. F.; Frank Rhea, General Electric Company; J. W. Reid, C. & A.; J. R. Savage, Long Island; M. Schreiber, Public Service Railway; W. I. Trench, B. & O.; H. U. Wallace, Northern Colorado Power Company; A. G. Shaver, C. R. I. & P.; Walt. Dennis, C. R. I. & P.

COMMITTEE XIX.—CONSERVATION OF NATURAL RESOURCES.

1. Continue the study of tree planting and general reforestation.
2. Continue the study of coal and fuel oil resources.
3. Continue the study of iron and steel resources.

William McNab, G. T., chairman; C. H. Fisk, Cons. Eng., vice-chairman; R. H. Aishton, C. & N. W.; M. Burpee, Bangor & Aroostook; F. F. Busteed, C. P. R.; A. W. Carpenter, N. Y. C. & H. R.; W. A. McGonagle, D. M. & N.; G. A. Mountain, Canadian Railway Commission; W. L. Park, I. C.; G. H. Webb, M. C.; R. C. Young, L. S. & I.

SPECIAL COMMITTEES.

Grading of Lumber.

1. Continue the collection of current specifications, grading and inspection rules for maintenance of way timber and lumber, not heretofore reported on, and present same for all classes of maintenance of way timber and lumber, which will conserve the interests of railways and be acceptable to manufacturers' associations; conferring with committees of this association and with other organizations whose work is affected.
2. Prepare standard specifications for timber for treatment, conferring with Committee on Wood Preservation.

Dr. Hermann von Schrenk, Cons. Timber Eng., chairman; B. A. Wood, M. & O., vice-chairman; W. McC. Bond, B. & O.; D. Fairchild, N. P.; R Koehler, S. P.; A. J. Neafie, D. L. & W.; W. H. Norris, Me. C.; J. J. Taylor, K. C. S. R.; R. C. Sattley, C. R. I. & P.

Uniform General Contract Forms.

1. Continue the study of general contract forms, including forms for bonds and proposals.

W. G. Atwood, L. E. & W., chairman; C. A. Wilson, Cons. Eng., vice-chairman; J. C. Irwin, Cons. Eng., B. & A.; C. Frank Allen, Mass. Inst. of Technology; E. F. Ackerman, L. V.; Thos. Earle, Pennsylvania Steel Company; J. P. Congdon, Cons. Eng.; R. G. Kenly, M. & St. L.; E. H. Lee, C. & W. I.; C. A. Paquette, C. C. C. & St. L.; H. C. Phillips, A. T. & S. F.; J. H. Roach, L. S. & M. S.; C. A. Wilson, Cons. Eng.; H. A. Woods, G. T. P.

FLOOD DESTRUCTION ON THE BALTIMORE & OHIO.

The damage done to the railways in Ohio, Indiana and adjacent states by the floods following the storms of the last week in March have been covered from week to week in these columns. A brief description of the organization now engaged in the reconstruction of the damaged lines of the Baltimore & Ohio—one of the principal sufferers—will indicate how this emergency has been met by the various railway systems. In less than two weeks' time, train service has been restored on nearly all the lines affected and much headway has been made in permanently rebuilding the damaged lines.

After a careful inspection of the devastated territory by Daniel Willard, president; A. W. Thompson, vice-president, and Francis Lee Stuart, chief engineer, it was estimated that the damage to the Baltimore & Ohio lines will reach $2,500,000 to $3,000,000, and that the damage in Ohio alone will be between $1,500,000 and $2,000,000. From their observation of the condition of other lines, they estimated that the damage to all railways in Ohio may reach $10,000,000. This inspection showed that in addition to many miles of track covered with water and broken by washouts, 12 bridges on the main line of the Baltimore & Ohio were put out of service, including those over the Muskingum river at Zanesville, Ohio, and at Marietta, Ohio, over the west fork of the White river at Washington, Ind., over the big Miami river at Lawrenceburg, Ind., over the little Miami river at Hamilton, Ohio, over the east fork of the White river at Brownsville, Ind., and over the Blue river at Morristown, Ind.

Immediately upon receipt of information regarding the extent of the floods, an emergency organization was effected in both the operating and engineering departments. Portions of the lines which had been damaged were temporarily divided into separate divisions with despatching organizations and division officials in charge. These local organizations were maintained until repair

work was gotten under way, when the division organizations were restored.

The resources of the entire system were placed at the disposal of the affected lines. By the time the water receded enough to enable work to be done, 6,000 laborers with camp trains, tools, equipment and commissaries were waiting at various points between Parkersburg, W. Va., and Pittsburgh to enter the flood districts. Large forces were also gathered west of the trouble. Eighteen pile drivers were immediately put in operation, six of these machines having been secured from western railways. Divers were employed to examine the abutments and piers of the damaged bridges, as well as those that remained intact. The reconstruction work has been pushed night and day, pile drivers, derricks, steam shovels and other equipment being operated in double shifts.

The work of reconstruction has been divided into districts, being placed in charge of different officers of the engineering staff as follows: Paul Diddier, principal assistant engineer, Pittsburgh, in charge of Zanesville territory and rebuilding Zanesville bridge; A. M. Kinsman, engineer of construction, Cincinnati, in charge of the Indiana division, B. & O. S. W., west from Cincinnati; J. T. Wilson, district engineer, Baltimore, in charge of the B. & O. S. W., east from St. Louis; L. G. Curtis district engineer, Chicago, in charge of the Indianapolis division, C. H. & D., including Hamilton yards and bridge; J. B. Carothers, special engineer, Baltimore, in charge of the Columbus district; F. E. Lamphere, assistant engineer, Chicago, in charge of the Louisville district and Lawrenceburg bridge; B. R. Hundley, assistant engineer, Chillicothe, Ohio, in charge of the Chillicothe district and yards; and Claude Brown, assistant engineer, Chicago, in charge of the Toledo division, C. H. & D. and Dayton district. Plans for new bridges and buildings and the repair of existing structures are being made under the direction of W. S. Bouton, engineer of bridges, and A. M. Long, assistant to chief engineer.

In order that no time shall be lost in the replacement of bridges options were immediately taken on bridge steel, and contracts have already been let for the rebuilding of the bridges at Zanesville, Hamilton and Lawrenceburg, while other contracts will be placed as soon as possible for the remaining structures. Further contracts have already been let for a retaining wall to protect the railroad tracks at Kent, Ohio, where a heavy washout occurred, and for rebuilding the outbound freight station which collapsed at Dayton.

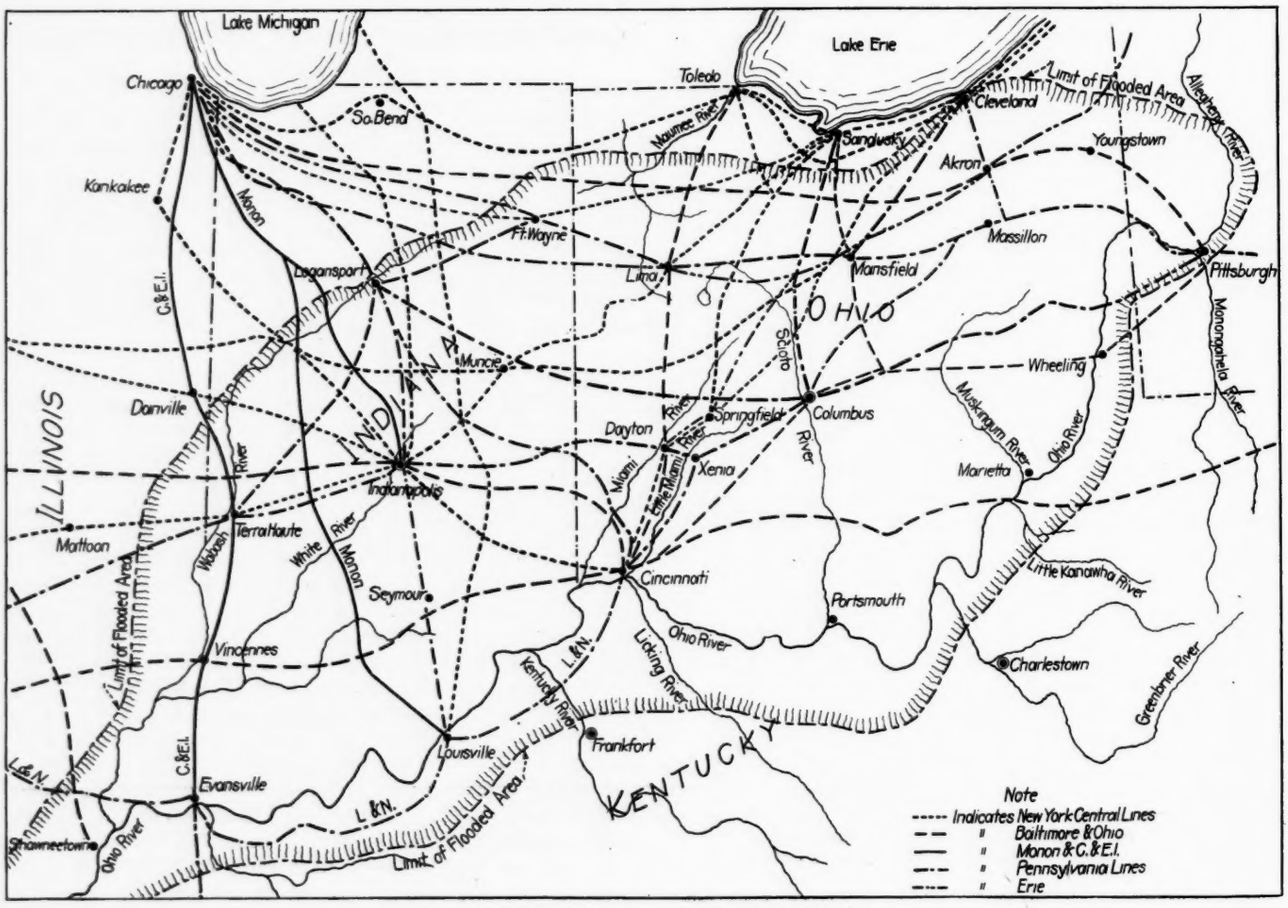
CARE IN TRACK WORK.*

By John A. Johnson,
Section Foreman, Peninsula Division, Chicago & North Western.

In hiring men a track foreman should make a special effort to impress upon them the necessity for carefulness and thoughtfulness during their service, and explain very plainly the dangers and accidents that will result from recklessness. Safety demands this. When foremen must employ foreigners, they should see that the men are first supplied with a book of rules and regulations pertaining to the work on or about the track, that they may become thoroughly acquainted with their duties. If foremen were allowed to pay their men wages that are paid other laborers locally, the present demand for foreigners who speak and understand little or no English would be reduced, and thereby make safer conditions in districts of three or four tracks.

Before starting out for work a foreman should make sure that his hand car is in a good and safe condition, and when

*Received in the Safety contest which closed October 25, 1912.



Principal Main Lines in the Flooded District.

going to and from work should never allow his men to place a track jack or a water keg on the front end of the car. He should also see that the necessary tools are placed so as to leave a clear and safe footing, and never under any circumstances, allow men to jump off and on the car while it is in motion.

During the daily work of laying or digging out ties, for instance, the foremen should watch that their men do not pile the gravel too high in the center of track, for an engine striking the piles might throw the gravel and stones with sufficient force to injure men standing near by. They should also see that tamping bars and track picks are not left in an upright position on the shoulder of the track while trains are passing, and should never let men work with defective tools. When a train is approaching, foremen should see that their men leave their work in time to reach a safe distance from the track. In unloading track material, such as rails and ties along the track, great care should be taken to leave a proper clearance, especially at switches. These are simple ideas, but if lived up to, many injuries and accidents will be avoided.

RAIL LAYING.*

By Engineer.

The most active season for track work should be the months of May and June. Probably more work per dollar can be obtained during the month of May than during any other month in the year. The weather is usually good; the temperature is such that men can work in comfort; they are usually willing to work and need money more than later in the season, and they have not reached the restless stage that comes with hot weather, when they desire to change their jobs and ask for higher pay. Of late, each year has seen this benefit of an early start more clearly recognized, one of the western roads having 3,800 men in extra gangs at work on April 1, this year, besides increasing the regular gangs. The additional labor required on account of the recent floods is likely to add to the expected scarcity of help during the present year.

The most important work under way in May is rail relaying. Methods of doing this are almost as varied as there are roads in the country. It may be done by large or small gangs. Where there is a large mileage to be relaid a large gang will be found more economical. It should be composed of chosen men, who as far as possible should be of large size on account of the character of the work. Seventy-five or 80 men is not too many to make rapid progress.

The gang should have a competent foreman with about three assistants, one to handle the men preparing for the rail laying, one to supervise the throwing of the rails out and in, and one to follow behind the rail laying with men finishing up. The foreman should have general supervision and should see that the parts of the gang are varied as the work may necessitate. As curves, switches, crossings, difference in men and other causes make one part of the work go faster than another, the men should be transferred accordingly.

The following arrangement of a gang has been found fairly typical and can be varied from at will: eight men pulling spikes, four men taking out bolts, two men putting in tie plugs, 12 men adzing ties, four men placing tie plates, 16 men handling rail, one man cleaning ties and one inserting shims, eight men bolting up rail, 14 men spiking and gaging the rail, two men distributing spikes and bolts and two men putting on rail anchors. These, with two water boys, would make up a gang of 80 men with foremen. A gang of this size properly officered and well housed should relay over a mile of track complete per working day, including unbolting the old rail ready to pick up, but not including any surfacing or tie spacing.

*The third of a series of articles on timely maintenance topics. The first appeared on page 351 of the issue of February 21 and the second appeared on page 498 of the issue of March 14.

Adzing is a very important detail of rail relaying, as on this depends the support of the rail on the ties and its degree of slant or cant. Ties should be adzed to a true plane, so that the tie plates on the rail may lay perfectly flat and bear on the tie over their entire area. If the rail is to be canted this may be accomplished by the tie plate or by adzing. Canting the rail is not a universal practice and with the heavy rail is not as necessary as formerly.

Spikes should be pulled on the inside of each rail only, except where the size of rail is changed when it may be necessary to pull three rows. Where possible bolts should be unscrewed, but frequently they will be found so rusted that it will be necessary to break them off. The practice of oiling bolts at intervals to prevent rusting is becoming more frequent, and where this is done no trouble will be found in removing the nuts.

The best method of spacing the rail to insure the proper expansion at the joints is to use steel shims, although many roads still use wooden shims, in spite of their objectionable features. With the heavy rail now in use, the amount of expansion can be cut down very much from what was formerly the practice, a reduction of ½ in., the expansion formerly provided for 65 lb. rail, being sufficient for 90 lb. rail.

Rail gangs should always be supplied with switch points, so that the track may be quickly closed for use without any rail cutting. On sharp curves the rail should be curved before laying either in the rail yard before shipment or by a small gang working ahead of the rail gang.

There are two methods of laying rail. One is to throw out a long string of rail on one side and throw in a string behind it, connecting up the new string before the old one is taken out, but this has the disadvantage that the expansion is lost in throwing in the new rail. The most generally adopted method is to throw out a string on one side and insert the new rails one at a time with the proper expansion. The laying on each side should as far as possible be carried along together, but this cannot always be done on account of curves, switches and traffic considerations.

In order to save handling when laying, the rail should be unloaded in the proper place when it is taken off the cars. Rail should never be thrown or dropped from the cars, but should be handled by an unloader of some kind, and so placed that it will have to be moved a minimum distance by the rail laying gang. If the gang has to carry the rail one-half length or more it lessens the amount of work they can accomplish very materially. Some roads have extra gangs and train crews especially organized and held for this work, who become skilled in it.

All material should be delivered before it will be needed, so that there will be no delays on account of a lack of material. A rail laying gang costs approximately $150 per day. An hour's delay means $15 lost, and ten minutes' delay $2.50 wasted. It is not uncommon to find rail laying gangs out of spikes or bolts, or tie plugs, which is usually a result of expensive carelessness on the part of somebody.

When a rail laying machine is used the number of men in the rail laying portion of the gang may be reduced accordingly. These machines are of recent invention and some of them are of advantage in handling rail, especially as the rail relaid is gradually becoming heavier every year.

Cutting new rail should be avoided as far as possible. Short rails should be used on the inside of curves to make the joints space properly, and can also be used between switches in station grounds. Second quality rails should not be placed in main tracks but in yard tracks and in leads or running tracks.

Rail taken up out of the track should be classified before being picked up by men specially trained, so that there will be no variation in the rail of any given quality over the road or system. After marking it should be picked up by an unloading machine or derrick, and the rail of each kind and quality loaded in lots by itself. This avoids much re-handling in the

rail yards if the rail is sent in for sawing or for distribution to other points.

It is customary on many roads to follow the rail laying gang closely with surfacing gangs, whose duty is to re-adjust the ties at the new joints and to surface the track in finished condition. However, this is not always done, and it is an open question as to whether it is not better to use stronger joints and lay the new rail without regard to where the joint comes on the ties, as is being done by some roads with very heavy traffic. Although this may be said to be in an experimental stage, it has several advantages, one of which is that it costs much less money and another that rail laying can go on in all seasons of the year, winter as well as in summer. If rail can be laid in the winter it is out of the way of other work, and gives an opportunity to employ men at a time when work is slack and they are easily obtained. It is also much easier to obtain and hold good men when they can have employment the entire year. Eliminating the spacing of ties saves disturbing the bed and does away with much of the consequent surfacing throughout the season. On the other hand, it requires a heavier and stiffer joint, as there is unquestionably a greater strain on the joint than when ties are spaced for it.

Rail laying should be pushed at this season of the year not only because it is a large and important part of track maintenance work, but also because much other important track work cannot be done until after the rail laying is out of the way. Ballasting must wait, tie renewals cannot be made, while surfacing also cannot be done.

THE GALESBURG TIE PLANT OF THE C. B. & Q.

The Chicago, Burlington & Quincy has given much attention during recent years to the subject of timber preservation and now operates two treating plants with a combined rated capacity of 2,800,000 ties. The first plant was built at Edgemont, S. Dak., in 1900, and was moved the following year to Sheridan, Wyo., where it is still located. Two retorts with an annual rated capacity of 800,000 ties are operated at this plant, all timber treated being pine cut locally in that vinicity. In 1907 a second plant with three retorts and a rated capacity of 1,200,000 ties was built at Galesburg, Ill., and has been in continuous operation since December of that year. During the past year this plant has been enlarged and two retorts added, while arrangements have been made for the addition of a sixth retort at an early date. These new facilities have been completed and were placed in service about the first of the present year. This plant is now probably the largest treating plant operated by a railway company to treat timber for its use exclusively, and is one of the largest commercial or railway plants in the country in output of treated material.

The annual requirements of the Burlington are now about 3,000,000 ties. The capacity of the Galesburg plant as now enlarged is 2,500,000 ties, based upon treating red oak. However, as about 40 per cent. of the material treated at this plant previous to the enlargement consisted of piling and lumber, it is anticipated that only about three-fourths of the ties required will be treated at the two plants combined. All ties treated at Sheridan are used on the lines west of the Missouri river, while over 305,000 ties were also shipped to the same territory from

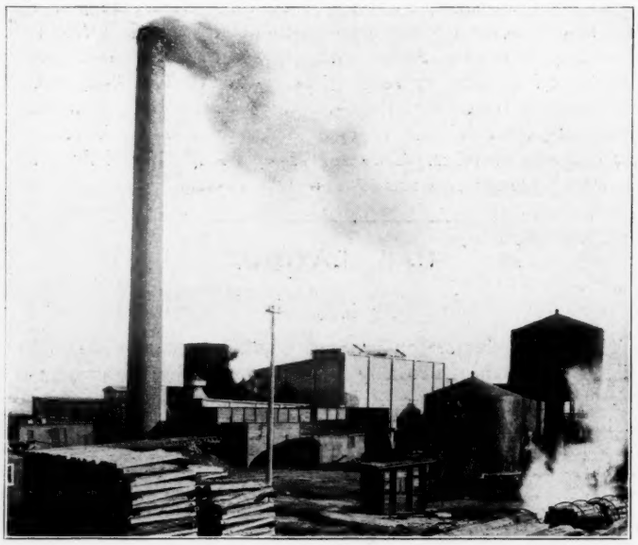


Fig. 2—General View of Treating Plant.

the Galesburg plant last year. Nearly all the ties treated at Galesburg come from the south; the larger proportion coming from the Tennessee and Green river countries in Tennessee and Kentucky, and being delivered to the Burlington at Metropolis, Ill., on the Ohio river. Some ties are also secured at St. Louis and locally along the line. Of the ties handled at Galesburg last year, 60 per cent. were red oak, 26 per cent. short leaf pine, and

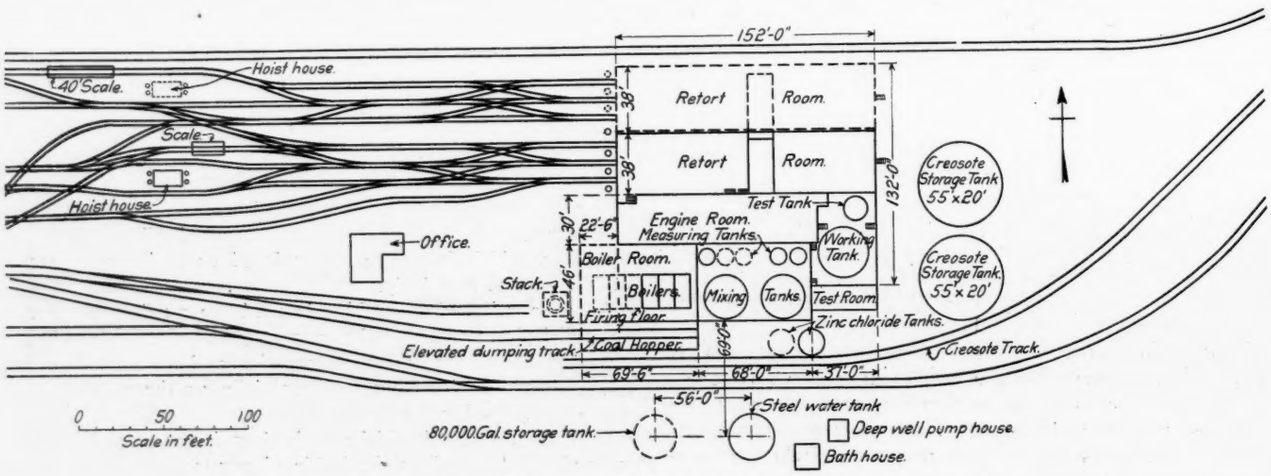


Fig. 1—Plan of New Facilities at Galesburg Tie Plant.

10 per cent. cypress, while the percentages of red oak and short leaf pine ties received the preceding year were 74 and 12, respectively.

The type of construction originally adopted in the Galesburg plant and which has been followed in the additions, is reinforced concrete throughout. Provision was made for future additions when the plant was originally constructed, so that the enlarge-

ment made the past year was carried on without interfering with the operation of the existing plant. The facilities added last year are shown clearly by the dotted lines in the accompanying drawing. The principal additions were in the retort room, which was doubled in size, and in the boiler room, where provision was made for three additional boilers, although only two are installed at the present time.

While concrete has not been generally adopted in the construction of wood preserving plants largely because of its increased cost, it adapts itself readily to this work. Although

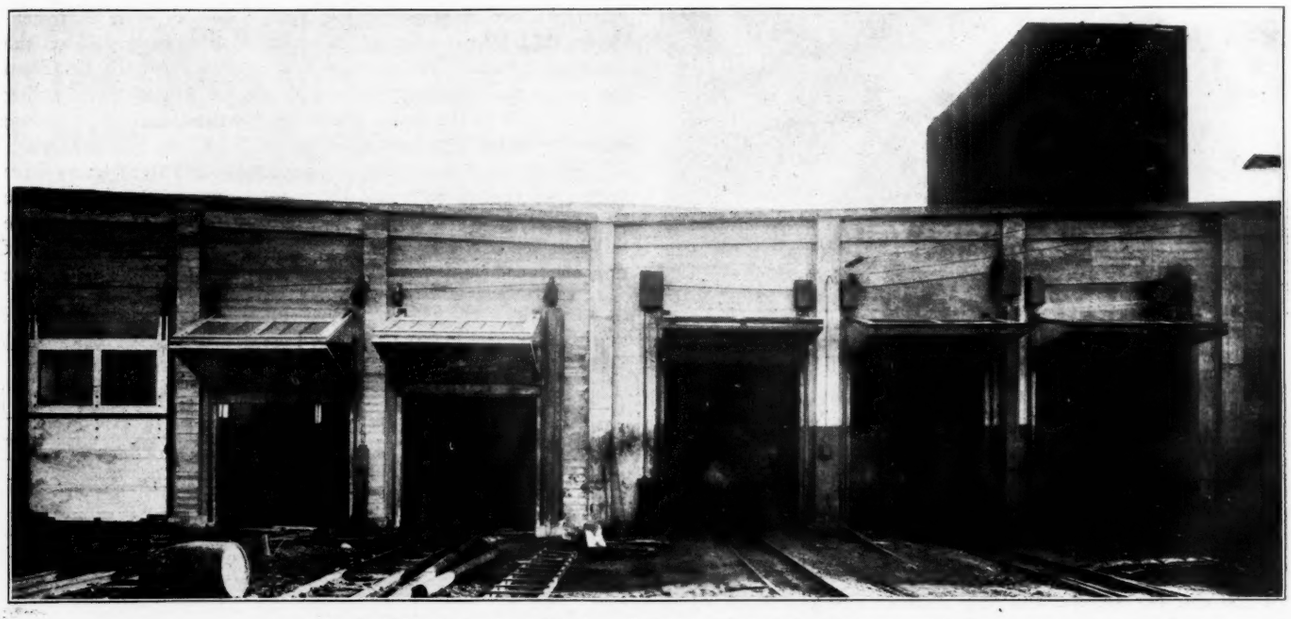


Fig. 3—Retort Room with Doors Open—Two New Retorts on Left.

no attempt was made to bring out pleasing architectural details in the Galesburg plant, the building presents a neat appearance, especially in view of the purpose for which it is intended. With concrete floors and walls, the plant can be readily kept clean, as the oil will not penetrate it as it does timber, and it is, of course, fireproof.

The roof is of reinforced concrete slab construction 5 in. thick, waterproofed with Ceresit, the slabs being supported on concrete walls and pillars. Two skylights are provided in the new addition to assist in lighting the interior. The new retorts

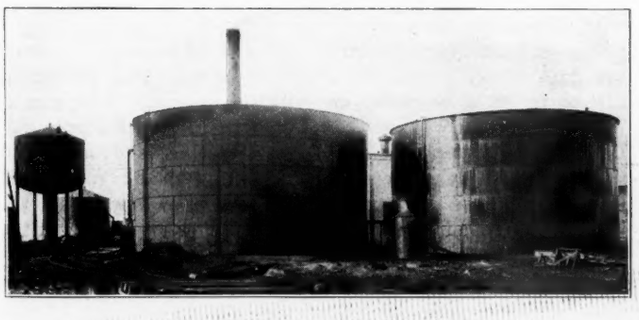


Fig. 4—Creosote Storage Tanks.

are of the same size as the original ones, namely: 132 ft. long by 6 ft. 2 in. in diameter, and will hold 16 trams of ties or an average of 1,952 cu. ft. of timber in one charge. The new retorts vary from the old ones in that swinging doors are provided at each end so that access to the retorts may be gained at either end in case of an accident. Only one door will be used except in such cases. The steel steam pipes within the retorts have also been replaced with cast iron, as it has been found that the solution used in the card process attacks either steel or wrought iron. Similar substitution is being made in pipe lines carrying the treating solution throughout the building as fast as they require renewal.

Two 80,000 gal. working tanks were replaced with steel tanks of the same dimension, and these tanks, in common with three 10,000-gal. measuring tanks previously installed and two new ones, were housed over to protect the tanks and to prevent the loss of heat during the winter. A new shallow well was dug to replace a deep well, the water from which had caused some trouble in the boilers. A 125-ft. Wiederholt concrete stack was built just outside of the boiler room, this type of stack being lined both outside and inside with tile and the area between these tile faces being filled with concrete. The inside diameter of the stack is 8 ft. 10½ in. at the bottom and 6 ft. 6 in. at the top.

During 1912, 10,914 cars of material of all kinds were handled

Fig. 5—Looking Down Loading Platform Toward Treating Plant.

in and out of the Galesburg tie yard. In the three retorts 623,926 oak and 303,942 soft wood ties were treated last year. Approximately 1,375,000 ft. B. M. of decking and sills for stock cars, 5,000,000 ft. B. M. of switch ties and 141,776 lineal ft. of

piling were also treated in addition to considerable quantities of wood blocks and other miscellaneous material.

In loading ties for treatment they are grouped into three classes based upon their moisture content, and these classes are further subdivided into No. 1, No. 2 and No. 3 ties, according to their condition. Class A ties are those absorbing less than 22 per cent. by volume of preservatives and include principally oaks, hickory, beech, hemlock and tamarack. Class B ties are those which absorb from 23 to 30 per cent. by volume of preservatives, and include hard maple, ash, sycamore and Douglass fir. Class C ties are those absorbing over 30 per cent. by volume of preservatives, and include elm, the pines, maple, birch and cypress. For Class A ties a mixture of 77 per cent. of 5 per cent. zinc chloride solution and 23 per cent. of creosote is injected at a pressure of 175 lbs. per sq. in. For Class B ties a mixture of 81 per cent. of 4 per cent. zinc chloride solution and 19 per cent. of creosote is injected at a pressure of 150 lbs. per sq. in., and for Class C ties a mixture of 85 per cent. of 3 per cent. zinc chloride solution and 15 per cent. of creosote is injected at a pressure of 125 lbs. per sq. in. The No. 1, No. 2 and No. 3 ties are for main line, branch line and side track use, respectively. Only ties of one general class are treated in one retort, while each tram contains only ties of the same class and number.

Fig. 6—Piles Stored in the Yard.

Fig. 7—View in Tie Yard Showing Method of Stacking Ties.

Practically all material is handled at this plant by piece work, including such heavy material as piling, which is loaded with cranes. In unloading ties from the car to the pile and in loading them from the pile to the tram, each man works alone, while in unloading ties from the tram into a car after coming out of the retort, two or three men work together and divide their earnings equally. All the men, however, are carried individually on the pay roll. A foreman is assigned to each class of work, who sees that the work is done properly and who keeps a record of the work done by each man. One Browning crane and two small steam shovels rebuilt into cranes assist in loading piling, some switch ties and all other heavy lumber. Piece work rates are applied here as in the other part of the yard, except that the crane engineers are on a monthly basis. All foremen are also paid on a monthly basis. The piece work rates vary with the kind of wood carried, a higher price being paid for heavy hardwood than for lighter soft woods. No variation is made, however, for the height of piles, these depending largely upon the condition of the yard and the amount of room available. From 80 to 100 men, mostly Austrians, are employed in the yard. For the month of February, 1913, 96 per cent. of all unskilled labor was paid on the piece work basis. The average cost of unloading the ties from the car to the pile last year was $0.708 per hundred, of loading from the pile to the trams $0.666 per hundred, and of unloading from the trams into cars after treatment $0.596 per hundred.

To provide against delays at the retorts, sufficient trams have been provided to keep all the retorts going 48 hours if the loading in the yard should be stopped for any reason. While this number of trams is larger than usually found in plants of this size, sufficient ties are thus continually loaded to enable

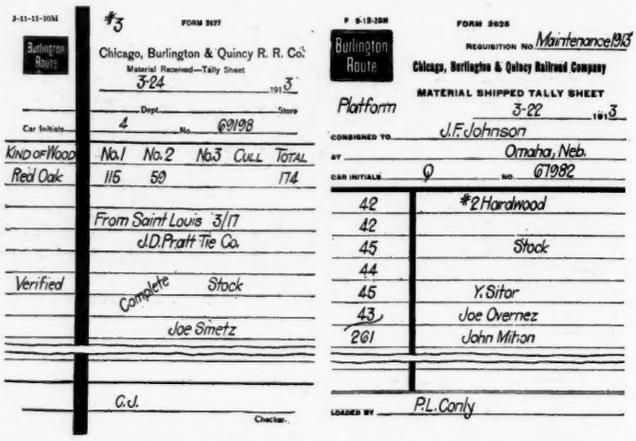


Fig. 8—Forms for Keeping Records of Shipments.

the plant to operate full time even though the weather may be such as to prevent the men from working outside. In this connection it is interesting to note that there were only 284 retort hours delay last year from all causes, including charging the retorts and repairs, in comparison with 22,423 retort hours actually operated, or 1.25 per cent. delay. The plant is closed on Sundays and holidays, but operates 24 hours per day otherwise throughout the year.

The tie yard covers 95 acres, and is provided with 10 standard gage tracks connected to ladders at each end, permitting cars to be set in or pulled out with the minimum interference. This yard layout was described in detail in the *Railway Age Gazette* of February 16, 1912. All switching is done with a small standard gage locomotive which also places the loaded trams in front of the retorts. The trams are drawn from the retorts to the loading plant by a cable wound on a drum at the end of this platform.

In loading out switch ties on requisitions where material is loaded for more than one station, care is taken to load the sets complete with those for the station nearest Galesburg on the top, unless a reverse order is specified on the requisition. The top layer for each station is marked with the requisition number, station and number of pieces, and the material for each station is separated from that for other stations by strips laid crosswise on the car. In this way the material for each station can be unloaded without any rehandling and without the necessity of getting the shipment confused. No car is loaded for points on more than one division. A rule recently put into effect also requires that all requisitions for switch ties must state specifically the numbers and lengths of each size of ties

required, instead of simply ordering a set complete, as was frequently done previously.

To simplify the clerical work incident to tracing and answering inquiries about the large number of shipments into and out of this yard, a card system has been adopted in which cards printed in red are used for inbound shipments and cards printed in black for outbound cars. On these cards is placed a complete record of the shipment. The sample card shown for outbound shipment, for instance, gives the kind of ties, method of loading, number of ties in each tram loaded and the names of the men loading the car. Two cases are provided in the office for filing the cards by the last two figures, each case having 100 pigeonholes. Horizontally, the pockets are numbered from 1 to 10 for the last figure, and vertically from 1 to 10 for the next to the last figure. In this way a full record of the shipment can be readily secured when the car number is known.

This plant is operated under the direction of J. H. Waterman, superintendent of timber preservation of the Chicago, Burlington & Quincy, and A. Meyer, supervisor of the Galesburg plant. W. T. Krausch, engineer of buildings, was in charge of the design and construction of the additions to this plant.

TABLE FOR ESTIMATING COST OF TRACK.

The accompanying table is in use on the Morgan's Louisiana and Texas road for making quickly approximate estimates for the cost of building short spur tracks or sidings. Frequently an estimate for such a track is demanded of a roadmaster without

Statement Showing Figures and Method of Approximating The Cost of a Spur Track or Siding.

Table 1 showing cost of installation of switch and lead for weights of rail varying from 50 to 90 lb. Total length of lead.

Weight of Rail.	Cost of Lead 176' Long.
90 lb.	$529.47
80	456.80
76	422.33
75	427.53
61½	348.41
60	344.36
56	329.77
50	298.31

Table 2 showing cost per track foot of track for different weights of rail using 8 and 9 ft. ties

Wt. of rail	Cost per Track ft. using 9' Ties	Cost per Track ft. using 8' Ties.
90 lb	$1.616	$1.529
80	1.470	1.383
76	1.424	1.337
75	1.405	1.319
61½	1.260	1.174
60	1.237	1.150
56	1.166	1.080
50	1.120	1.030

Note: Labor and 8% for incidentals and use of tools was included in the above

Table 3 Total Yardage For 100 ft. of Track 16 ft Crown.

Fill.	6" Fill.	1 ft Fill	½ ft Fill	2 ft Fill	2½ ft Fill	3 ft Fill	3½ ft	4 ft	5 ft	6 ft	7 ft Fill	8 ft Fill
Cu. yd.	31	65	101	141	183	228	275	326	435	556	687	330

Cost of grading and team work will vary from 18 to 25 cents per yd. Train haul 40 cts.

Illustration.

To find the Appx. cost for Construction of a 600 ft Spur. Rail in Main Line 76 lb. Spur to be of 60 lb. Steel. (Switch and lead will always be same weight as in main line)

Main Line

76# rail. ← 176' → ← 424'-60# rail →

From Table 1: 76 lb. Lead cost $422.33
Track 600 ft. long minus 176 ft. for lead = 424 ft. of 60 lb. Steel
From Table 2 1 ft. of track 60 lb. Steel and 8 ft. Ties Cost $1.150
424 ft. @ $1.15 = $487.60 Cost of 60 lb. Track.
Yardage Assuming an average of 1 ft. fill @ 20¢ per yard
from Table 3: 1 ft. fill = 65 cu. yds. × 600 ÷ 100 × 20 = $78.00 Total cost of Grading.
∴ Total cost of Track $422.33 + $487.60 + $78.00 = $987.93

Cost of Miscellaneous Items which may be added to Estimate.

In block signal territory $100.00 is to be added to estimate for the installation of each switch. Ordinary pile trestle figured at $15.00 per lineal ft. Creosoted pile trestle figured at $27.00 per lin. ft. Ordinary pit cattle guards figured at $75.00 each. Creosoted pit cattle guards figured $95.00 each. Crib cattle guards figured at $40.00 each.

Cost per ft. for Ordinary Wooden Boxes
1x2 Box $1.00 per Lin. ft.
2x2 " 1.50 " " "
2x3 " 2.50 " " " $15.00 for
3x4 " 3.00 " " " Add 25.00 } Wing
4x4 " 3.75 " " " 32.50 } Walls

Cost per ft. for Creosoted Wooden Boxes
2x2 Box $1.60 per lin. ft. $20.00
2x3 " 3.00 " " " Add 30.00 for
3x4 " 3.45 " " " 30.00 } Wing
4x5 " 4.54 " " " 30.00 } Walls

Telegraph Poles { Cost of moving 1 to 5 poles $20.00 per pole.
" " " 5 to 10 " 15.00 " "
" " " 10 or more 10.00 " "

sufficient time to enable him to consult with the engineer. The accompanying table based upon the cost of material on this road is sufficiently accurate for all practical purposes. If more detailed figures are required, it would, of course, be necessary to make a survey on the ground. This table was prepared by John H. Gardiner, to whom we are indebted for this information.

General News.

The Colorado legislature has defeated a full crew bill, and also an anti-pass bill.

The Chicago & Eastern Illinois was fined $10,000 in the federal court at Chicago on April 9 for 100 violations of the federal hours of service law during the month of November, 1912.

Senator Cummins, of Iowa, has introduced in Congress a bill forbidding carriers to limit their liability for loss of freight as one of the considerations imposed for making reduced rates for transportation.

The number of pensioners on the lines of the Pennsylvania Railroad system who are over ninety years old is nine, as indicated by the list of names printed in our last issue. The number of pensioners more than eighty years of age is 296.

The legislature of the state of Washington has passed a law making it a misdemeanor for trespassers to enter a railroad right of way on which more than one main track is in use. The bill was introduced by a senator who was formerly a Northern Pacific conductor.

The first conviction under the law recently enacted by Congress providing the penalties for stealing, or attempting to steal, from freight cars containing interstate shipments, is reported from St. Louis, where Philip Nagle was found guilty in the United States district court and sentenced to a term of five years in the federal prison at Fort Leavenworth.

A bill has been introduced in the Illinois legislature to amend the present union station statute adopted in 1874, to provide that companies formed for the purpose of building union stations may be organized with a capitalization not to exceed $50,000,000. The present limit is $3,000,000. The bill was introduced in the interest of the proposed new stations in Chicago.

The government has begun suit in the United States district court at Columbus, Ohio, against the Union Depot Company of Columbus; the Baltimore & Ohio, and the Cleveland, Cincinnati, Chicago & St. Louis for violation of the hours of service law. The suits call for penalties aggregating $97,000, and the cases apparently refer to the work of telegraphers in offices where the nine-hour limit is or should be applied.

The New York State College of Forestry, Syracuse, cooperating with the New York Central & Hudson River, is to plant trees on fifteen acres of the railroad company's experimental farm at North Chittenango, N. Y., with a view of finding out the best kinds of wood to grow in that locality for use as ties. The New York Central uses annually about 3½ million ties in its tracks in the state of New York, and the object of the College of Forestry is to see if some of the millions of dollars now sent to other states and countries for sleepers cannot be kept in New York.

At the trial of Messrs. Horn and other officers of the New York, New Haven & Hartford for manslaughter, at Bridgeport, Conn., on Tuesday of this week, President Charles S. Mellen and Vice-President E. H. McHenry, who were present in court, were indicted on charges of manslaughter, and were held in $5,000 bail each. These indictments, issued by the court in connection with the derailment at Westport, last October, appear to be a result of the dissatisfaction of the state's attorney with the progress of his cases against the four men who had been previously indicted. The despatches indicate that none of the trials will be again taken up until some time in May.

Senator Gronna has introduced in Congress a bill to amend the interstate commerce law by empowering the Interstate Commerce Commission to regulate the speed with which freight shall be carried. There is a clause requiring twenty miles an hour to be maintained with live stock. For unreasonable delays the carrier may be penalized to the extent of the losses caused by the delays, and, in addition, five dollars per car per hour. Representative Lafferty has introduced in the House a bill extending the authority of the Interstate Commerce Commission in Alaska, and instrucing the War Department to build a railroad in Alaska from Controller Bay to the coal fields on Bering river.

Car No. 999 of the Erie, the business car of President Underwood, has been equipped with six telephones for speaking between the different parts of the car—the staterooms, the observation-room, the stenographer's desk, and the kitchen. The telephones are hand sets made by the Western Electric Company. Being held in the hand, the vibration of the wheels on the rails has no disturbing effect on the telephones. For calling, buzzers are used, each telephone having a set of call buttons arranged on a dial plate. The car has connections by which its occupants can converse over outside telephone lines when the car is standing at a station, calls being made by an interrupter, operated from a battery. Other business cars on the Erie are to be equipped with telephones.

Steel Corporation's Unfilled Tonnage.

The report of the United States Steel Corporation shows that the volume of unfilled tonnage on March 31 was 7,468,956 tons, compared with 7,656,714 tons at the end of February, a decrease of 187,758 tons. On January 31, the unfilled tonnage was 7,827,368 tons; on December 31, 1912, 7,932,164 tons; and on March 31, 1912, 5,304,841 tons.

Derailment on the Central Vermont.

In the derailment of a special passenger train on the Montreal-Chambly line of the Central Vermont, in Quebec, last Sunday afternoon, the fireman and six passengers were killed and 15 persons were injured. The derailment occurred about four miles from St. Lambert and 16 miles from Montreal. The train carried several hundred passengers, guests of a real estate company returning to Montreal. It is said that the speed of the train was not over 30 miles an hour. The cars were so crowded that many persons were standing on the car platforms, and it was mostly among these that the fatalities occurred. The cause of the derailment is reported as defective track. The engine was running tender first.

Derailment at Tula, Mexico.

Press despatches of April 20 report the derailment of a passenger train on the Mexican Central near Tula, state of Hidalgo, April 10, in which 20 passengers were killed and 40 injured. It is said that the derailment was due to excessive speed and that the engineman ran at unsafe speed around a curve, because of the importunities of the passengers, who feared an attack of the rebels who are fighting the government.

Railway Museum at the University of Illinois.

For some months past the railway engineering department of the University of Illinois has been collecting pictures, relics and models illustrating the historical development of the railroad and representing also current practice. This material forms a permanent exhibit in the new Transportation building, and it will be added to from time to time. A very generous response to requests for such material has been made by railway officers and by manufacturers. Other persons having interesting material of this sort are invited to contribute if they feel so disposed. Everything put into the collection will be well cared for and it will be of general benefit. Communications may be addressed to Prof. Edward C. Schmidt, Urbana, Ill.

Latest Phase of Railway Regulation in Texas.

The suit instituted by the attorney general to prevent the carrying out of the provisions of the consolidation bill passed by the legislature is most unfortunate. That the bill was overwhelmingly and imperatively demanded by the people is true beyond all question. The consolidation affected the people living in all the territory from Wichita Falls to Waco, and from Waco to Trinity, and from Trinity to Beaumont and Port Arthur. The people demanded that the bill be passed, and their servants obeyed their behest.

While the governor was opposed to the bill from the first, he was justified in submitting it to the attorney general for his opinion as to its constitutionality, and when that opinion was adverse he was justified, on that ground, in vetoing it; hence the governor may be eliminated from the equation. The attorney general is now responsible for the stay of building railroad connections sorely needed.

As the completion of the Panama canal draws near, all the great trunk lines are making every possible effort to get to tidewater, and the people in Texas are profoundly interested. The people have the unrestrained and unrestrainable right to say what railroads they want and where they shall be built, and neither the attorney general nor any other man has the right to seek to thwart their purposes.

Conceding that the constitutionality of the law is debatable, every doubt should be resolved in favor of the will of the people. The action of the attorney general has very much the appearance of trying to get even with the legislature because it disregarded his opinion by passing the bill over the gubernatorial veto.

Who is going to be harmed by giving the state new lines of railway? What evil can follow upon allowing a great railway system to get in touch at tidewater with the commerce of the world? Why should not the people of the imperial realm of the Northwest. . . .

The home town of the attorney general is indebted for the larger part of its gratifying growth to the very railroad whose progress into other fields he now seeks to obstruct. It has spent millions of money in Texas. It asks the privilege of spending millions more, but now one man, who was nominated by the very narrowest of margins, rises to say, "The people be damned. I will not permit their commands to be executed." How long will the people stand such trifling with their wishes? —*Houston Chronicle.*

Headlight Laws.

The legislature of Colorado has passed a bill requiring all locomotives to be equipped with headlights of not less than 1,500 c. p. Headlight bills have also been passed at this session by the legislatures of seven other states—Nevada, Vermont, North Dakota, Iowa, Oregon, Missouri and Minnesota. The Nevada, Missouri and Minnesota bills provide for 1,500 c. p.; the North Dakota bill for 1,200 c. p., and the Vermont bill leaves the determination of this point to the railroad commission. In Oregon and Iowa the laws provide that the light shall be sufficiently strong to enable the engineman to see a person on the track at distances of 800 and 1,100 ft. respectively.

Pere Marquette Investigation.

President S. M. Felton, of the Pere Marquette, resumed his testimony before the legislative committee that has been investigating the affairs of the road at Detroit on April 10. He produced statistics regarding operating expenses and revenues to show that passenger rates under the 2-cent fare law are not sufficient to provide for satisfactory service, and declared that it should be self-evident that in a state like Michigan, with a population of only 40.2 per square mile, the density of passenger traffic must be less than in states where the population is much greater. He pointed out that in Pennsylvania, with a population of 171 per square mile, the courts had decided the 2-cent fare law unconstitutional, and that in New York, with a population of 191 per square mile, Governor Hughes had vetoed the 2-cent fare law. He said the Pere Marquette's passenger business, which yielded $4,023,039 in 1912, would have yielded $741,677 more under the old rates. For 1912 the earnings from passengers, mail, express, baggage, parlor and chair cars, and miscellaneous passenger service revenues, were $4,946,796, while the expenses properly charged against this service were $5,283,198, a cost per passenger mile of 2.35 cents. The average fare was 1.79 cents per passenger mile. He thought the rate should be advanced to 2½ cents a mile.

On April 11, W. D. Trump, manager of the Detroit Terminal Railroad, and formerly general superintendent of the Pere Marquette, was a witness before the committee. He testified in detail regarding various expenditures and improvements made during his connection with the road, saying that the property had not been properly maintained in recent years. In one year, he said, no new steel was laid, and some of the rails had been in the track for 30 years. He was inclined to criticise the financial management of the road, and declared that much of the money spent was wasted. He criticised the purchase of the Chicago, Cincinnati & Louisville, and the extension to Chicago.

He disagreed with President Felton's figures regarding the expenses of the passenger service, saying he believed it was profitable to the company, even with the 2-cent fare.

Several shippers testified regarding the quality of the service rendered by the Pere Marquette.

Chicago Council Renews Electrification Agitation.

At the first meeting of the new city council in Chicago on April 14, a committee on railway terminals, consisting of 15 aldermen, with Ellis Geiger as chairman, was appointed to deal with such subjects as electrification of railway terminals and the location of proposed new passenger stations. One of the first ordinances introduced at the meeting was one to require the railroads to use electric power or other power that will not produce smoke on their terminal lines in the city by July 1, 1914. It was referred to the new committee. An ordinance providing for the discontinuance of the use of steam locomotives within the city has been lying dormant with the committee on Local Transportation for about two years, the agitation for electrification having practically ceased following the appointment of a committee of the Chicago Association of Commerce, which has been making a thorough investigation of the subject. The resolution was introduced on the alleged ground that the investigation is being unduly protracted.

St. Louis Railway Club.

At the meeting of the St. Louis Railway Club, held April 11, J. R. Cavanagh, superintendent of freight transportation, New York Central Lines, made an address on Car Efficiency.

Association of Railway Electrical Engineers.

The annual convention of the Association of Railway Electrical Engineers will be held at the hotel La Salle, Chicago, October 18-24.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxom, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

A press despatch from Albany says that the Erie Canal will not be opened until June 1, much damage having been done by floods at Vischer's Ferry. The Champlain Canal will be opened for traffic May 15.

The meeting of the National Industrial Traffic League called for April 15, was postponed on account of the meetings of the Western and Southern classification committees and flood conditions along the Ohio river and its tributaries.

Following the recommendation of the governor of New Hampshire, the legislature of that state has considered a report from a special committee proposing a scheme for the regulation of railway rates during the next two years; and has instructed the committee to reconsider its action, and to report a measure giving the Boston & Maine more liberal terms.

As a result of arrangements made by the Illinois Central, it is announced that a monthly steamship service between New Orleans and Argentine will be started on June 15, by Andrew Weir, of London, making connections with all lines entering New Orleans. The ships for the service will be of over 8,000 tons capacity. The first boat will be berthed at New Orleans on June 15, and will sail on June 30.

Motion pictures showing the effects of the recent floods at Dayton, O., were presented at an entertainment given by the Traffic Club of Chicago on April 10. The pictures were described in a lecture given by H. F. Miller, business manager of the Chicago Association of Commerce, who was in charge of the relief work of the association in Ohio, and who obtained the pictures during the first week of the flood.

The Chicago, Burlington & Quincy has established on the first floor of its new general office building at Chicago, a permanent agricultural exhibit, consisting chiefly of samples of products of Nebraska, Colorado, Wyoming and Montana. Lectures on farming in these four states will be given from time to time by prominent agricultural experts. James J. Hill attended the opening of the exhibit on April 10.

The Board of Estimate and Apportionment, New York City, has taken action to acquire, on behalf of the city, extensive tracts of land for terminal facilities along the shore of the East river, south of the Brooklyn bridge, the purpose being presumably to provide for the barges which will carry freight through the Erie canal after it has been enlarged. The property named in the resolutions of the Board of Estimate is valued at $1,182,200.

Following the announcement, last week, of the decision of the Interstate Commerce Commission, concerning the issuance of free passes to shippers in Colorado, it is now definitely stated that the commission asked for the indictment of the Colorado Fuel & Iron Company, the Victor American Fuel Company, the Colorado Porcelain Cement Company, the United States Porcelain Cement Company, the Great Western Sugar Company, the Colorado & Southern Railroad Company, and the Denver & Rio Grande Railroad. The commission says that the Atchison, Topeka & Santa Fe for about ten years resisted the movement to give passes to influence traffic, but finally, because of the persistency of its competitors, it deliberately resorted to the means practiced by them for stimulating the good will of shippers. The commission suggests that the courts should be more severe in dealing with these offenses against the law.

The Pennsylvania announced on Monday of this week that all of its lines in Ohio and Indiana which had been damaged by the recent floods had been rebuilt so that regular trains would be restored; though for a time through cars would be operated subject to delay. On Thursday of this week the company announced the re-establishment of regular freight service throughout its lines. The Illinois Central resumed through passenger traffic by way of Cairo on the 12th, except that the Panama Limited was not restored, through travel being almost suspended in the Southern states because of the general flood conditions in the Mississippi valley. Through traffic was suspended on the Illinois Central for ten days—April 2 to 11, inclusive. The Cleveland, Cincinnati, Chicago & St. Louis began running passenger trains to Cincinnati last week by using the line of the Detroit, Toledo & Ironton from Springfield to Washington, C. H., and the Baltimore & Ohio thence to Cincinnati. The Chesapeake & Ohio was re-opened for traffic through to Chicago on the 10th.

The New York, New Haven & Hartford announces that arrangements have been made for the prompt transmission of information concerning delayed trains to offices of the company at New York, New Haven, Providence, Boston, Hartford, Springfield and Worcester. In New York City the information will be recorded at Room 3624, Grand Central Terminal. For the benefit of passengers who may wish to find this room, it may be remarked that this number means room 24, in corridor 6, on the third floor. Anything happening to a train which will delay it for more than 30 minutes will be at once reported by telegraph to these centers of information. If a train is likely to be more than one hour late, the fact will be noted at the bulletin board in the Grand Central Station concourse with a note that detailed information can be had by going to the room upstairs. If there should be an accident causing injury to passengers, the names of the injured persons would be sent as early as possible to the information rooms. These special information bureaus will also keep informed concerning sleeping cars which are delayed and are attached to other than their regular trains.

Car Location.

The accompanying table, which is taken from car location bulletin, No. 4-A of the American Railway Association, gives a summary of freight car location by groups on March 15, together with surpluses and shortages on the same date.

CAR LOCATION ON MARCH 15, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	90,082	677,535	284,148	202,848	172,362	467,972	16,427	150,947	30,830	129,803	117,983	2,340,937
Home Cars on Home Roads	43,630	357,471	88,480	104,506	74,145	284,028	3,160	70,626	12,945	66,213	73,937	1,179,141
Home Cars on Foreign Roads	46,452	320,064	195,668	98,342	98,217	183,944	13,267	80,321	17,885	63,590	44,046	1,161,796
Foreign Cars on Home Roads	57,443	304,936	197,023	102,077	86,879	206,952	12,020	71,690	25,810	60,665	54,214	1,179,709
Total Cars on Line	101,073	662,407	285,503	206,583	161,024	490,980	15,180	142,316	38,755	126,878	128,151	2,358,850
Excess or Deficiency	10,991	*15,128	1,355	3,735	*11,338	23,008	*1,247	*8,631	7,925	*2,925	10,168	17,913
Surplus	323	6,160	4,657	5,844	1,455	8,559	1,455	8,077	4,189	17,963	1,617	60,299
Shortage	1,193	2,765	1,845	2,333	3,994	3,483	100	193	59	654	3,965	20,584
Shop Cars—												
Home Cars in Home Shops	4,445	28,207	16,081	8,606	10,495	19,906	457	8,266	1,601	4,339	3,468	105,871
Foreign Cars in Home Shops	1,554	8,604	7,168	2,335	2,467	5,027	501	2,188	887	2,547	681	33,959
Total Cars in Shops	5,999	36,811	23,249	10,941	12,962	24,933	958	10,454	2,488	6,886	4,149	139,830
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	48.43	52.76	31.14	51.52	43.02	60.69	19.24	44.79	41.99	51.01	62.67	50.19
Total Cars on Line	109.61	97.77	100.42	101.84	93.42	104.92	92.41	92.65	125.71	97.75	108.62	100.77
Home Cars in Home Shops	4.93	4.16	5.66	4.24	6.09	4.54	2.78	5.48	5.19	3.34	2.94	4.58
Foreign Cars in Home Shops	1.07	1.27	2.52	1.15	1.43	1.14	3.05	1.37	2.88	1.96	.58	1.47
Total Cars in Shops	6.00	5.43	8.18	5.39	7.52	5.68	5.83	6.85	8.07	5.30	3.52	6.05

*Denotes deficiency.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 141, giving a summary of car surpluses and shortages by groups from December 20, 1911, to April 1, 1913, says: The total surplus on April 1 was 68,792 cars; on March 15, 1913, 57,998 cars; on March 27, 1912, 52,682 cars. Compared with the preceding period; there is an increase in the total surplus of 10,794 cars, of which 5,411 is in box, 1,156 flat, 2,342 coal and 1,885 miscellaneous cars. The increase in box car surplus is in all groups, except 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 9 (Texas, Louisiana and New Mexico). The increase in flat car surplus is in groups 1 (New England Lines), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8, 9 (as above), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona). The increase in coal car surplus is in all groups, except 3 (Ohio, Indiana, Michigan and western Pennsylvania), 8 and 10 (as above). The increase in miscellaneous car surplus is in groups 1 (as above), 6 (Iowa, Illinois, Wisconsin and Minnesota), 7, 8, 9 and 10 (as above).

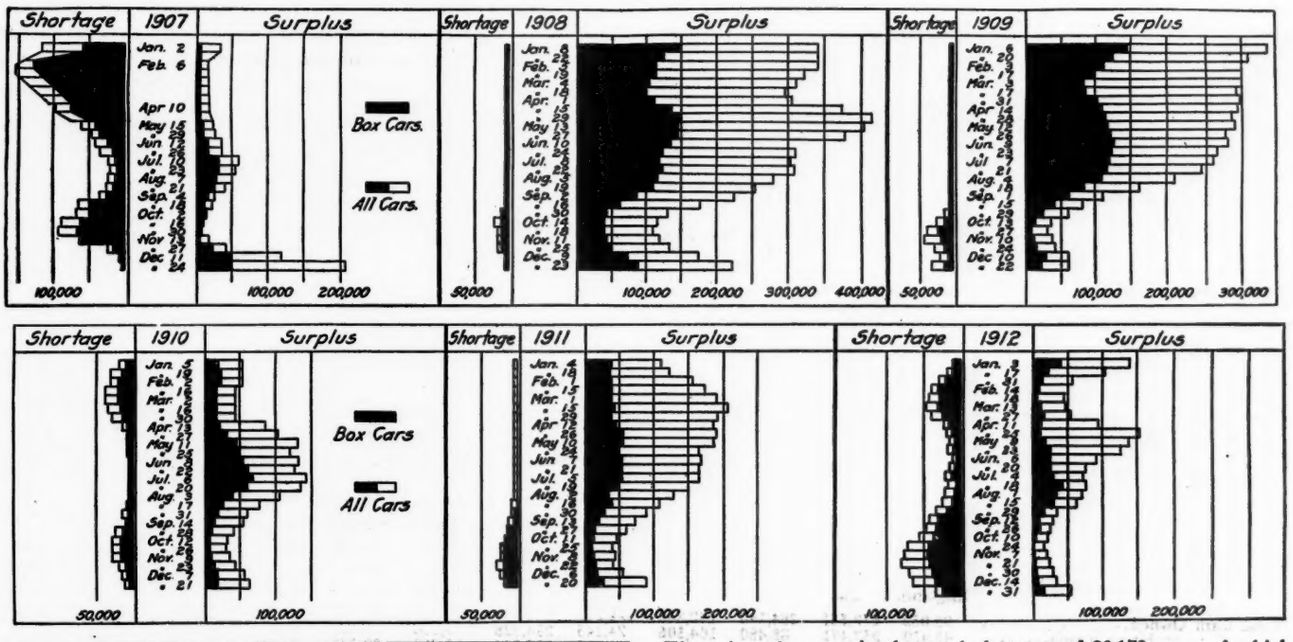
The total shortage on April 1 was 10,804 cars; on March 15, 1913, 20,223 cars; and on March 27, 1912, 33,974 cars. Compared with the preceding period; there is a decrease in the total shortage of 9,419 cars, of which 5,601 is in box, 629 in flat, 2,376 in coal and 813 in miscellaneous cars. The decrease in box car shortage is in all groups, except 2 and 8 (as above). The decrease in flat car shortage is in all groups. The decrease in coal car shortage is in all groups, except 3, 9 (as above), and 11 (Canadian Lines). The decrease in miscellaneous car shortage appears in groups 1, 3 (as above), 4 (the Virginias and Carolinas), 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 6, 9 and 11 (as above).

Compared with the same date of 1912; there is an increase in the total surplus of 16,110 cars, of which 8,362 is in box, 7,669 in coal, 2,318 in miscellaneous and a decrease of 2,239 flat cars.

Car Surpluses and Shortages.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—April 1, 1913	7	670	540	321	144	1,675	0	56	0	0	56
" 2.— " 1, 1913	35	358	65	4,303	114	4,840	210	0	182	15	407
" 3.— " 1, 1913	34	552	485	1,215	1,672	3,924	1,515	0	554	471	2,540
" 4.— " 1, 1913	11	5,430	57	1,574	560	7,621	754	403	400	0	1,557
" 5.— " 1, 1913	26	454	7	1,412	536	2,409	980	411	150	47	1,588
" 6.— " 1, 1913	30	5,138	213	3,368	3,570	12,289	902	40	55	85	1,082
" 7.— " 1, 1913	6	381	183	1,453	767	2,784	40	0	15	18	73
" 8.— " 1, 1913	19	1,414	291	2,792	3,412	7,909	209	4	0	57	270
" 9.— " 1, 1913	15	1,607	444	635	1,544	4,230	0	1	33	9	43
" 10.— " 1, 1913	25	6,295	1,587	3,009	8,595	19,486	57	24	0	217	298
" 11.— " 1, 1913	7	744	199	127	555	1,625	2,383	288	11	208	2,890
Total	215	23,043	4,071	20,209	21,469	68,792	7,050	1,227	1,400	1,127	10,804

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

There is a decrease in the total shortage of 23,170 cars, of which 12,363 is in box, 6,759 in coal, 4,371 in miscellaneous and an increase of 323 flat car shortage.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

Car Balance and Performance.

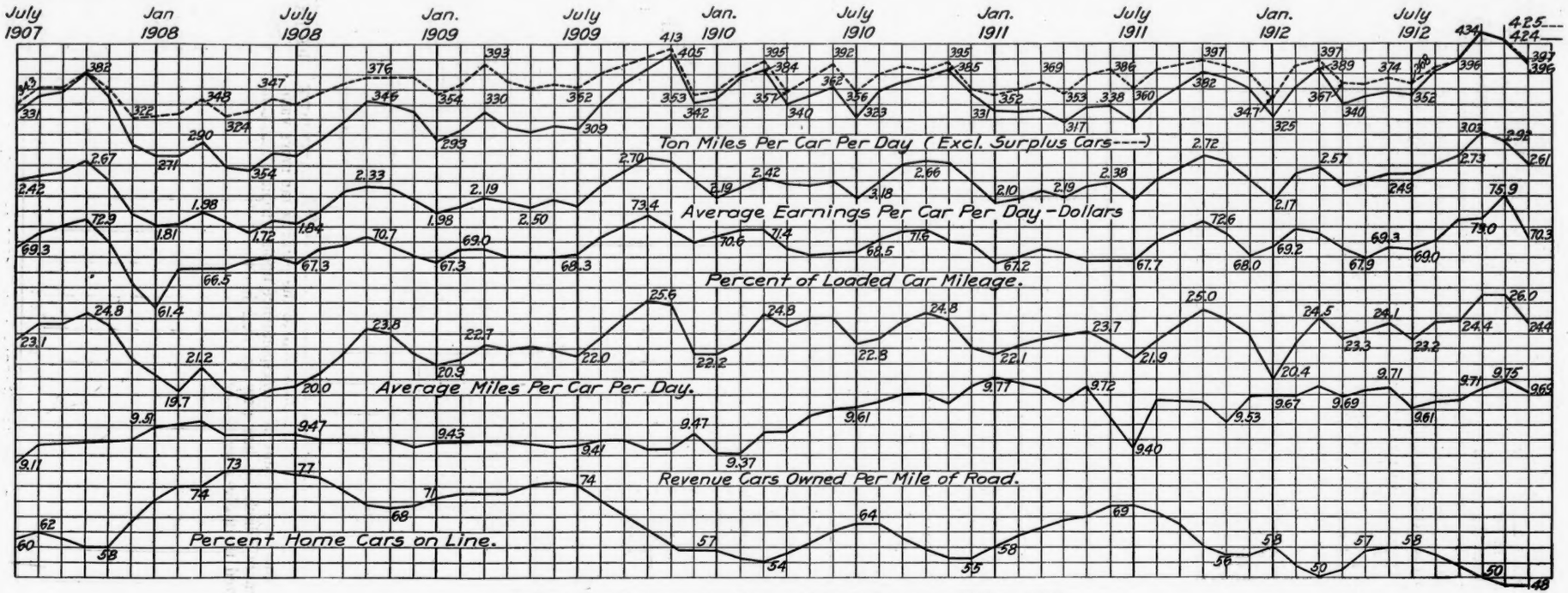
Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association in presenting statistical bulletin No. 142 covering car balances and performances for December says:

The miles per car per day, for December was 24.4 compared

Car Balance and Performance in December, 1912.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	83,477	673,017	222,376	189,638	168,783	405,413	17,175	141,289	29,984	144,160	129,264	2,204,576
Average number of system cars on line	37,861	308,787	99,678	84,438	63,709	247,214	4,160	55,103	16,449	60,110	85,544	1,063,053
Railway-owned cars: Average foreign on line	58,017	334,412	119,598	78,817	78,963	174,969	11,710	80,957	40,621	65,611	62,367	1,106,042
Total Railway-owned cars on line	104,302	643,199	219,276	163,255	142,672	422,183	15,870	136,060	57,070	125,721	147,911	2,177,519
Excess	12,401	*29,818	*3,100	*26,383	*26,111	16,770	*1,305	*5,229	27,086	*18,439	18,647	*35,481
Per cent. of cars on line to total owned:												
Home	45	46	45	45	38	61	24	39	55	42	66	48
Foreign	70	49	54	41	47	43	68	53	135	45	48	50
All railways	115	95	99	86	85	104	92	92	190	87	114	98
Private cars on line	4,310	43,349	11,129	5,563	9,519	16,480	1,675	10,104	4,666	13,349	3,670	123,814
Total, all cars on line	108,612	686,548	230,405	168,818	152,191	438,663	17,545	146,164	61,736	139,070	151,581	2,301,333
Per cent. of cars in shop	6.30	5.30	7.86	6.60	7.60	6.09	5.69	6.51	4.95	4.19	3.96	6.00
No. of freight engines owned	1,412	10,246	3.137	3,456	2,826	6,578	539	2,777	852	3,047	2,154	37,024
Average cars on line per freight engine owned	77	67	73	49	54	67	33	53	72	46	70	62
Total freight-car mileage	57,407,641	528,409,959	157,450,449	135,068,687	124,461,088	314,398,413	26,283,227	99,928,180	43,309,153	134,718,145	118,187,274	1,739,622,216
Average miles per car per day	17.1	24.8	21.7	25.7	26.1	22.8	49.7	23.3	22.7	31.3	25.2	24.4
Per cent. loaded mileage	72.4	66.8	71.7	68.0	73.2	72.1	78.1	71.1	65.0	72.6	74.7	70.3
Ton-miles of freight, including company freight	673,185,280	9,039,053,765	2,764,806,887	2,221,660,447	1,756,239,904	3,812,455,407	468,957,574	1,521,464,156	540,423,167	1,990,861,182	1,893,378,018	26,682,485,787
Average ton-miles, including company freight:												
Per car-mile	11.7	17.1	18.4	16.7	15.3	15.8	18.3	15.2	12.5	15.0	16.0	16.2
Per loaded car-mile	16.2	25.6	25.6	24.5	21.0	22.0	23.4	21.7	19.2	20.7	21.4	23.2
Per car per day	200	425	399	429	398	360	910	354	284	470	403	396
Gross freight earnings	$7,184,729	$50,245,379	$14,872,003	$13,696,383	$13,181,102	$34,366,934	$3,234,714	$12,880,917	$5,084,698	$19,856,631	$11,919,153	$186,522,643
Average daily earnings: Per car owned	$2.48	$2.41	$2.16	$2.33	$2.52	$2.73	$6.08	$2.84	$5.47	$4.46	$2.97	$2.72
Per railroad car on line	2.16	2.52	2.19	2.71	2.98	2.63	6.58	2.94	2.87	5.12	2.60	2.76
All cars on line	2.08	2.36	2.08	2.62	2.79	2.53	5.95	2.84	2.66	4.63	2.54	2.61

*Denotes deficiency.



Freight Car Mileage, Earnings and Performances, 1907 to 1912.

with 26.0 for November. This figure for December, 1911, was 23.4.

Ton miles per car per day was 396, this figure for November was 424. This is an increase of 9.70 per cent. over the figure for December, 1911.

The proportion of home cars on line was 48 per cent., maintaining the same figure as in November. This figure for December, 1911, was 56 per cent.

There is a decrease of 5.6 points to 70.3 per cent. in the percentage of loaded car mileage compared with November, 1912. The per cent. of loaded car mileage in December, 1911, was 68.0 per cent.

The average earnings per car per day of all cars on line were $2.61, compared with $2.92 in November, 1912. This is an increase of 9.21 per cent. over the earnings for December, 1911, which were $2.39.

The table on page 914 gives car balance and performance in the month covered by the report, and the diagram shows car earnings and car mileage and different car performance figures monthly from July, 1907.

Wells-Fargo Conferences.

Under the administration of B. D. Caldwell, who came to it in October, 1911, as president, Wells Fargo & Company has entered upon a pretty thorough scheme of reorganization. Mr. Caldwell's long experience as a railroad man has stood him in good stead in facing the situation of the express business at a particularly difficult time in its history. Without any great disturbance of the personnel of the system he has brought to his aid a number of railroad men who have been instrumental with him in the important work of bringing Wells Fargo & Company in line with the best transportation practices of today.

One of Mr. Caldwell's innovations has been the holding of a conference semi-annually of his heads of departments and chiefs of staff. While this had been done to some extent before, he has made the conferences institutions of great service to the company. The most recent of these was held in St. Louis during the week beginning Tuesday, April 8. To it came all Wells Fargo officers from general superintendents up and a complete discussion was held of the various routine as well as special topics affecting express companies at the present time. Wells Fargo & Company is a keen believer in the efficiency of committee work, and this conference saw the appointment of many committees which will report to the next gathering of a similar sort. These committees are charged with study of and recommendation upon operating problems and problems relating to the public efficiency of the company. The management of Wells Fargo & Company has the idea that the working of the express could and should be utilized to a large extent in an improvement of the movement of food products. It believes that the express can be a large agent in the expedition of perishable food between the grower and the various markets, and so a real factor in a possible solution of the cost-of-living problem.

Of the general value of these conferences there is little doubt in the ranks of Wells Fargo & Company. It is difficult to operate any transportation organization employing some thousands of men and covering a large territory, but when that organization embraces 36 states, some 90,000 miles of steamship and railroad lines, and has its executive offices in New York, with its operating headquarters at both Chicago and San Francisco, these difficulties multiply. To talk over personally, with the men of this company, the many problems that confront them was what Mr. Caldwell sought in inaugurating these conferences, knowing that a general discussion held well to the point is far more valuable than any amount of correspondence upon a topic. The conferences which he has now so well inaugurated have already proved themselves worthy of the time and effort they require.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended until June 20 the supplement to the tariff of the St. Louis & San Francisco, which increases rates for the transportation of potatoes, in carloads, from points in Oklahoma to points in Colorado from 4 to 14 cents per 100 lbs.

The commission has suspended until July 26, certain schedules published in a supplement to the tariff of the Kansas City Southern, which proposed to increase rates on lumber from points in Missouri, Oklahoma and Arkansas to Des Moines, Iowa, one cent per 100 lbs.

The commission has suspended from May 1 until July 8, the tariff of the Wabash, Chester & Western. This tariff proposed to advance rates on flour in carloads, from Chester and other stations in Illinois to Paducah, Ky., from 9 cents to 10½ cents per 100 lbs.

The commission has suspended from April 1 until July 17, the supplements to Agent C. J. Pierce's tariff, which would cancel joint through rates on news printing paper from stations located on the Grand Trunk to points on the Bangor & Aroostook routing via the Maine Central.

The commission has suspended from March 31 until September 30, certain schedules in supplements to the tariffs of the Southern Railway and the Norfolk & Western, which would advance rates on furniture from High Point, N. C., and other stations to Boston, New York, Philadelphia, Baltimore and other points.

The commission has suspended from April 1 until July 30, certain supplements to Agent William Cameron's tariff, which contain increased rates on bituminous coal and bituminous coal briquettes, carloads, from Illinois mines to St. Louis, Mo. The proposed advance amounts to 5½ cents per net ton from all mines.

The commission has suspended from April 9 to October 9, certain schedules in Agent R. H. Countiss' tariff, which contain advanced rates for the transportation of lumber, shingles and other articles subject to lumber rates from stations located on the Washington Western in the state of Washington to eastern destinations.

The commission has suspended until July 30 the schedules in certain tariffs, which would increase switching charges for the movement of cars containing coal and coke over the Chicago & North Western from junctions with connecting carriers to Ravenswood, a station within the switching limits of Chicago. The increase would amount to approximately 15 cents per ton.

The commission has suspended from March 27 until July 25, a supplement to the tariff of the Chicago, Milwaukee & St. Paul, which proposed to increase rates on wheat, flour, corn, rye, oats and barley from Spencer, Iowa, and other points to Sioux City, Iowa, and intermediate points, the increases ranging from 1 to 6.2 cents per 100 lbs. on wheat and flour, and from 1.05 to 7.65 cents per 100 lbs. on other grain.

The commission has suspended until July 30 the supplement to the tariff of the Delaware, Lackawanna & Western, which would cancel commodity rates applicable to the transportation of butter and cheese, any quantity, from points on the Cincinnatus branch to New York and other points, leaving in effect class rates, which would result in advancing rates on butter 5 cents, and on cheese 1 cent per 100 lbs.

The commission has suspended from April 1 until July 30, a provision changing the classification of bridge iron and bridge material in carloads, from Class N to Class I, Note 28, contained in a supplement to the Southern classification. The proposed change would increase as much as 200 per cent. rates applicable to the commodity in question moving over the lines of the Louisville & Nashville. For example, the present rate from Memphis at Athens, Ala., is 11 cents, and the proposed rate 33 cents per 100 lbs.

The commission has suspended until July 17 certain tariffs, which would cancel all joint rates between points on the lines of certain eastern roads, the Grand Trunk and points located on the Bangor & Aroostook on shipments routed via the Maine Central, which action is understood to be the result of a dispute between these carriers over a proper division of the through rates in effect. On and after the dates above named the use of combination rates, as provided for in the suspended tariffs, would have resulted in an advance in all class and commodity rates, varying in amount according to the commodity and length of haul.

The commission has suspended until August 4, the schedules in the tariffs of certain boat lines which proposed to add to the list of articles the transportation of which is prohibited, butter,

eggs, fresh meats and live or dressed poultry. The tariffs of the carriers involved name class and commodity rates from Duluth and other upper lake ports to Buffalo and interior eastern points, including Boston, New York and Philadelphia, reached by lake and by lake and rail, and the proposed change would compel shippers to forward the commodities above specified via all rail routes. The present lake and rail rate on eggs from Duluth to New York is 65 cents per 100 lbs., any quantity, and the all-rail rate for the same commodity between the same points is $1.09 in carloads and $1.12 in less than carload quantities.

Commodity Rates Increased.

Corporation Commission of Oklahoma v. Abilene & Southern et al. Opinion by Commissioner Clements:

In the original report the commission decided that the defendants' class and commodity rates from Oklahoma into Texas were unreasonable and unjustly discriminatory. The commission did not at that time prescribe any reasonable rates for the future, but held the case open for the parties to submit a proposed scale of mutually satisfactory class rates, if such a scale could be agreed upon. A conference was held, but the parties failed to agree. The commission in this report prescribed reasonable rates for the future. (26 I. C. C., 520.)

Improper Charges Assessed.

C. C. Follmer & Co. v. Canadian Pacific et al. Opinion by the commission:

The complainant shipped a carload of shingles weighing 40,800 lbs. from Abbottsford, consigned to itself at Menasha, Wis. The shipment moved via the Canadian Pacific and the Minneapolis, St. Paul & Sault Ste. Marie. It was loaded in a Canadian Pacific 36 ft. car, but before reaching Menasha, was reloaded by the Soo line into two smaller cars. Upon arrival at Menasha, the shingles were re-consigned as one shipment to Rochester, N. Y., and were carried forward in the two cars via the Soo line to Manitowoc, Wis., and thence via the Pere Marquette and the New York Central & Hudson River to the destination. From Abbottsford to Manitowoc charges were assessed on the actual weight of the shipment, but from Manitowoc to destination they were assessed on a weight of 27,300 lbs. for the first car, and on a minimum weight of 24,000 lbs. for the second car. The complainant contends that the charges were unreasonable to the extent that they exceeded a through rate of 80 cents per 100 lbs. based on the actual weight of the shipment. The commission found that there was no through rate applicable to this shipment, but decided that the intermediate rates were improperly assessed, and also that the Soo line was not justified in transferring the shipment from one to two cars and charging for more than the actual weight of the shipment. Reparation was awarded. (26 I. C. C., 512.)

Texas Common Point Case.

In re investigation and suspension of advances in rates by carriers for the transportation of certain commodities between certain stations located in Texas Common Point territory, and St. Louis, Mo., and other points. Opinion by Commissioner Harlan:

The defendants desire to reduce the extent of the Texas Common Point territory by excluding certain towns near the western border, including Sweetwater, Big Springs, San Angelo, Brady and Ballinger. The only reason given by the defendants for this move is that Amarillo, Tex., which competes with the towns just mentioned, and which is located just west of the Texas Common Point territory, now takes higher rates than Texas common points, with the result that Amarillo is discriminated against in favor of the towns above mentioned. The defendants contended that the loss of revenues attending lowering of their rates by putting Amarillo in common point territory would be substantially greater than the gain resulting from raising the rates of the points in question by excluding them from common point territory. The commission decided that the defendants had not justified the proposed increased rates. The traffic of the towns in question has grown rapidly, they have assisted the defendants in new construction, and in some cases the short line mileage is less now, than when those towns were first put in common point territory. If the defendants want to narrow the boundaries of the common point territory, they must do so in fair regard to the rights of the communities, which they propose to exclude, in their relation to the communities which would remain in the territory. The merchants and shippers of Amarillo urge that the boundaries of the common point territory be extended to include Amarillo. The commission found that if this were done, it would not be long before common point territory would cover the entire state of Texas, which was not desirable, and therefore decided not to grant the plea of the Amarillo shippers in full. The commission decided, however, that the defendants should be required to carry out the suggestion, at one time practically agreed upon, of giving Amarillo rates upon certain commodities on a parity with common point rates. No order was deemed necessary. (26 I. C. C., 529.)

Pig Iron Rate Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of pig iron from points in upper Michigan and Minnesota to Kansas City, Mo., and other destinations. Opinion by Commissioner Harlan:

The tariffs under suspension would raise the rates on pig iron from Duluth, Ashland and other points in Minnesota, Wisconsin and the northern peninsular of Michigan to a territory of distribution in which Kansas City and Omaha are the most important markets. To Kansas City and Omaha, the proposed schedules provide rates of $4.16 and $3.58 per ton respectively, in place of the present rates of $3.08 and $2.50. The Lake Superior Iron & Chemical Company has recently greatly improved its plants at points from which it is proposed to increase the rates. This company contends that these improvements were made with the understanding that the rate adjustment would not be changed and claims that the proposed rates would seriously injure its business. The commission decided that an investment made in an industrial enterprise in reliance upon an existing rate or relation of rates, cannot act as a hindrance to the re-adjustment of the rate structure if it is found to be unreasonable. The commission decided further that the present rate might be properly advanced, but that the proposed advances would be excessive. The commission ordered that in future the rate to Kansas City should not exceed $3.58 per ton, from Duluth, Ashland, Chocolay, Manistique, Newberry and other points involved; and that the rates to Omaha from those points should not exceed $3.08 per ton. (26 I. C. C., 284).

Crushed Stone and Sand and Gravel Rates Reduced.

Waukesha Lime & Stone Company v. Chicago, Milwaukee & St. Paul et al. Opinion by the commission:

In this case the complainant contends that the rates on sand and gravel, crushed stone and lime from Waukesha, Wis., to Chicago, are unreasonable and discriminatory. The Chicago, Milwaukee & St. Paul charges 2¼ cents per 100 lbs. on sand and gravel and 3½ cents per 100 lbs. on crushed stone from Waukesha to Chicago, 106 miles. The Chicago & North Western charges 4 cents per 100 lbs. on sand and gravel, and 3⅓ cents per 100 lbs. on crushed stone between the same points, 105 miles. The commission found that the complainant was discriminated against in favor of certain competitive points as regards the rates on sand and gravel and crushed stone. Crushed stone is more valuable than sand and gravel and therefore should take a slightly higher rate. The commission ordered the defendants to establish a rate of 2 cents per 100 lbs. on crushed stone in carloads and 1¾ cents per 100 lbs. on sand and gravel in carloads from Waukesha to Chicago. Reparation was denied. All the defendants charge 6 cents per 100 lbs. on lime between Waukesha and Chicago. The commission decided that this rate was not shown to have been unreasonable or discriminatory, and dismissed the complaint against it. (26 I. C. C., 515.)

COURT NEWS.

The decision of the Texas State Railroad Commission imposing a fine of $14,000 on the Missouri, Kansas & Texas for violation of the law requiring passenger trains to be run within thirty minutes of their regular time has been reversed by the Court of Civil Appeals. The court holds that the trains which were the subject of the commission's action were engaged in interstate traffic, and therefore the commission had no jurisdiction over them for the purpose of issuing an order of this kind.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$97,607	$31,679	$141,502	$27,711	$33,962	$3,522	$51,235	$5,321	$121,751	$19,751	—$131	$5,300	$14,320	—$8,602
Ann Arbor	292	100,197	34,281	146,026	22,920	23,035	3,745	58,709	6,022	114,431	31,595	—4,694	13,930	12,971	—20,064
Arizona Eastern	366	183,624	37,328	232,582	31,607	21,956	2,627	60,676	4,617	121,483	111,099	—7	11,800	99,292	9,856
Atchison, Topeka & Santa Fe	8,242[1]	4,880,981	2,034,676	7,660,457	1,073,995	1,267,286	182,207	2,328,884	158,897	5,011,269	2,649,188	.....	339,933	2,309,255	102,090
Atlantic & St. Lawrence	167	123,750	19,623	159,250	20,241	22,131	5,004	99,531	4,812	151,719	7,531	.....	16,152	—8,621	—2,980
Atlanta, Birmingham & Atlantic	645[2]	191,411	41,486	250,491	41,470	44,124	14,944	102,104	11,312	213,954	36,537	.....	13,375	23,162	—12,596
Atlanta & West Point	93	57,736	35,180	102,125	11,504	19,042	4,479	34,769	4,758	74,552	27,573	54	6,343	21,284	—8,833
Atlantic City	167	53,645	44,213	105,862	23,963	15,273	2,555	78,439	847	121,077	—15,215	—3,782	9,000	—27,997	—11,439
Atlantic Coast Line	4,613[3]	2,252,309	877,227	3,360,451	391,580	419,419	53,878	1,086,831	81,239	2,032,947	1,327,504	.....	107,090	1,220,414	232,966
Baltimore & Ohio—System	4,455[4]	5,917,841	961,016	7,362,870	833,540	1,433,164	164,848	3,169,598	159,316	5,760,466	1,602,404	—57,344	267,716	1,277,344	—32,932
Baltimore & Ohio Chicago Terminal	77	.....	1,507	121,040	7,505	24,028	651	66,101	4,847	103,132	17,908	827	19,115	—380	19,623
Bangor & Aroostook	631[5]	161,057	32,049	206,262	36,559	36,320	2,831	124,335	12,998	213,043	—6,781	.....	10,500	—17,281	—111,808
Belt Ry. Co. of Chicago	21	.....	.....	243,875	11,607	34,709	438	121,364	4,469	172,587	71,288	.....	7,928	63,360	4,158
Bessemer & Lake Erie	204	333,280	22,153	365,341	66,367	137,577	8,473	138,649	10,747	361,813	3,528	.....	12,000	—8,472	32,776
Boston & Maine	2,244	2,302,339	1,000,280	3,496,715	409,821	616,765	34,408	1,948,649	98,204	3,107,847	388,868	15,139	184,721	219,286	—295,355
Buffalo & Susquehanna *R. R.*	265	137,491	6,660	148,103	25,183	26,999	1,100	54,631	5,780	113,693	34,410	.....	2,200	32,210	19,553
Buffalo & Susquehanna *Ry.*	91	40,661	6,588	49,254	12,226	29,965	426	23,377	2,612	68,606	—19,352	—5	1,700	—21,057	—1,765
Buffalo, Rochester & Pittsburgh	574[6]	711,307	71,006	803,424	73,460	168,740	10,695	293,253	19,412	565,560	237,864	—1,187	19,000	217,677	—7,503
Butte, Anaconda & Pacific	46	86,667	7,803	104,866	10,885	26,220	640	57,377	2,622	97,744	7,122	.....	2,000	5,122	—14,105
Canadian Pacific Lines in Maine	233	126,629	26,355	162,017	13,285	30,081	5,650	7,147	6,243	126,406	35,611	.....	10,000	25,611	11,059
Carolina, Clinchfield & Ohio	238	174,886	12,032	191,505	13,569	22,124	6,711	35,089	8,054	85,547	105,958	.....	8,000	97,958	10,629
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	10,180	1,263	11,669	1,618	80	1,160	2,592	653	6,103	5,566	.....	500	5,066	—3,258
Central of Georgia	1,915	726,949	274,071	1,099,355	156,747	241,691	35,422	403,717	37,865	875,442	223,913	5,185	50,830	178,268	—160,359
Central of New Jersey	676[7]	1,653,514	357,704	2,158,798	167,072	347,700	26,023	655,931	43,892	1,240,618	918,180	—17,527	124,979	775,674	39,638
Central New England	277	219,727	23,450	258,491	27,459	36,104	937	78,191	4,747	147,438	111,053	—3,294	10,000	97,759	—40,925
Central Vermont	411	200,902	62,574	286,823	25,992	54,009	7,428	169,550	6,609	263,588	23,235	—199	16,927	6,109	16,765
Charleston & Western Carolina	341	132,142	24,050	164,534	27,407	25,237	2,877	59,279	5,496	120,296	44,238	.....	5,000	39,238	13,662
Chesapeake & Ohio Lines	2,324[8]	2,384,647	380,010	2,878,271	272,324	640,571	56,804	1,021,405	65,461	2,056,565	821,706	779	127,155	695,330	—60,793
Chicago & Alton	1,026	665,202	297,877	1,049,480	172,287	264,388	48,535	492,193	38,162	1,015,565	33,915	—2,138	39,000	—7,223	—202,041
Chicago & Eastern Illinois	1,275	994,655	225,827	1,330,420	124,878	295,868	26,502	526,962	37,381	1,015,591	314,829	—2,605	45,000	267,224	100,133
Chicago & Erie	270	351,696	45,518	447,647	69,452	101,813	20,880	260,932	12,218	465,295	—17,648	—371	13,333	—31,352	—52,238
Chicago & Northwestern	7,976[9]	4,076,419	1,414,631	6,092,448	640,705	988,847	116,449	2,677,753	134,736	4,558,490	1,533,958	2,461	303,000	1,233,419	595,374
Chicago, Burlington & Quincy	9,129[10]	4,798,015	1,440,953	7,035,296	589,413	1,270,196	118,006	2,482,512	214,313	4,674,440	2,360,856	—23,205	336,170	2,001,481	110,795
Chicago Great Western	1,496	779,868	202,701	1,070,607	100,179	167,982	45,458	454,795	34,902	803,316	267,291	940	36,595	231,636	116,270
Chicago, Indiana & Southern	359	315,499	21,148	352,609	40,172	94,010	7,285	142,515	11,355	295,337	57,272	509	15,283	42,498	—16,230
Chicago, Indianapolis & Louisville	617	321,927	111,828	485,324	73,663	85,677	15,774	203,950	12,883	391,947	93,377	.....	23,234	70,143	—10,805
Chicago Junction	12	.....	.....	145,250	13,044	13,592	996	85,666	3,137	116,435	28,815	.....	1,839	26,976	—14,136
Chicago, Milwaukee & St. Paul	9,592[11]	4,847,104	1,077,654	6,564,392	599,957	1,316,092	148,334	3,195,216	108,032	5,367,631	1,196,761	—10,887	328,391	857,483	26,849
Chicago, Peoria & St. Louis	255	94,621	21,563	123,357	18,745	25,092	6,924	70,105	6,784	127,650	—4,293	.....	4,300	—8,593	—19,143
Chicago, Rock Island & Gulf	477	209,106	53,278	279,692	29,036	39,829	10,056	105,988	8,450	193,359	86,333	—672	7,934	77,727	20,097
Chicago, Rock Island & Pacific	7,566[12]	3,285,242	1,281,168	4,916,751	638,432	772,484	157,334	2,312,865	138,812	4,019,927	896,824	—20,654	236,459	639,711	—175,367
Chicago, St. Paul, Minneapolis & Omaha	1,744	816,972	346,482	1,247,358	96,567	181,282	30,973	581,006	34,906	924,734	322,624	—3,431	67,433	251,760	93,840
Chicago, Terre Haute & Southeastern	351	123,288	15,034	141,823	16,018	30,573	2,869	51,512	6,785	107,757	34,066	—341	10,000	23,725	—25,932
Cincinnati, Hamilton & Dayton	1,015	566,672	104,506	749,326	87,706	151,327	18,420	362,324	17,661	637,438	111,888	.....	34,713	77,175	1,731
Cincinnati Northern	245	82,077	12,780	99,451	16,679	27,251	2,995	45,747	3,254	95,926	3,525	.....	5,500	—1,975	6,471
Cleveland, Cincinnati, Chic. & St. Louis	2,014[13]	1,881,844	532,091	2,656,525	275,028	573,246	68,339	1,164,032	54,977	2,135,622	520,903	—3,905	103,800	413,198	68,726
Colorado Midland	338	84,706	10,352	108,489	14,724	33,016	6,512	53,478	5,694	113,424	—4,935	—176	8,000	—13,111	—18,821
Colorado & Southern	1,069[14]	546,687	90,015	681,652	63,103	166,033	9,495	225,134	21,962	485,727	195,925	—965	29,175	165,785	14,086
Cumberland Valley	162	226,042	47,188	287,503	46,174	39,011	4,430	110,115	7,652	207,382	80,121	—274	5,702	74,145	24,606
Delaware & Hudson Co.—R. R. Dept.	854[15]	1,691,757	192,884	1,944,913	138,990	286,525	20,308	687,607	58,235	1,191,665	753,248	—1,958	49,700	701,590	122,585
Delaware, Lackawanna & Western	958	2,159,547	535,458	2,896,011	207,869	492,159	62,004	965,870	66,098	1,794,000	1,102,011	38,910	165,000	975,921	156,115
Denver & Rio Grande	2,550[16]	1,339,803	294,562	1,707,656	129,460	333,759	42,297	590,842	51,333	1,147,691	559,965	—6,611	80,400	475,954	177,456
Denver, Northwestern & Pacific	215	50,289	9,532	63,857	9,670	15,429	1,742	27,770	6,566	61,177	2,680	.....	3,500	—820	4,549
Detroit & Mackinac	411[17]	61,948	19,924	88,713	8,592	14,725	2,316	36,814	2,576	65,023	23,690	—126	8,379	15,185	—2,163
Detroit & Toledo Shore Line	79	125,510	.....	125,702	7,481	5,458	1,377	34,586	2,252	51,154	74,548	.....	7,237	67,311	21,253
Detroit, Grand Haven & Milwaukee	191	101,000	35,000	159,897	18,965	29,425	6,427	109,250	4,719	168,786	—8,889	—67	2,953	—11,909	6,281
Detroit River Tunnel	2	.....	.....	109,434	2,228	2,837	.....	9,311	73	14,449	94,985	.....	6,000	88,985	18,506
Detroit, Toledo & Ironton	441	100,734	9,325	120,430	35,069	66,666	2,567	74,860	4,898	184,060	—63,630	.....	5,000	—68,630	—84,176
Duluth & Iron Range	272[18]	79,798	20,011	108,087	35,264	49,314	847	65,918	10,566	161,909	—53,822	—2,738	5,541	—62,101	—8,690
Duluth, Missabe & Northern	356[19]	67,544	29,476	102,901	47,323	70,272	1,964	72,939	12,297	204,795	—101,894	—1,031	5,495	—108,420	76,817
Duluth, South Shore & Atlantic	627[20]	172,035	52,613	237,387	37,379	36,055	8,274	113,088	7,237	202,033	35,354	—703	18,000	16,651	—907
El Paso & Southwestern Co	974[21]	613,705	101,652	743,916	93,325	107,995	14,788	214,805	27,685	458,598	285,318	—1,543	35,000	248,775	1,075
Elgin, Joliet & Eastern	814[22]	948,240	7	1,016,915	108,487	179,114	5,218	333,672	16,275	642,766	374,149	.....	49,720	324,429	28,245
Erie	1,988[23]	3,008,679	604,824	3,992,458	304,957	789,231	100,197	1,487,426	94,664	2,776,475	1,215,983	—60,900	152,835	1,002,248	189,429
Florida East Coast	642[24]	246,957	339,342	663,498	61,424	75,021	9,388	219,765	10,669	376,267	287,231	—1,796	18,500	266,935	20,726
Fort Worth & Denver City	454	285,413	98,939	405,006	48,328	85,047	6,499	166,223	12,647	318,744	86,262	—500	9,087	76,675	2,787
Galveston, Harrisburg & San Antonio	1,338	628,246	266,726	955,784	123,412	215,244	37,073	455,281	28,259	859,269	96,515	7,888	27,726	76,677	—72,552
Georgia, Southern & Florida	395	127,122	74,878	225,233	25,594	35,127	7,297	90,247	8,983	167,248	57,985	.....	10,333	47,652	6,130

Average mileage operated during previous period—[1] 8,201; [2] 662; [3] 4,526; [4] 4,434; [5] 628; [6] 572; [7] 672; [8] 2,281; [9] 7,928; [10] 9,074; [11] 9,570; [12] 7,551; [13] 2,012; [14] 1,053; [15] 852; [16] 2,545; [17] 358; [18] 274; [19] 342; [20] 624; [21] 902; [22] 841; [23] 1,995; [24] 630. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1913.—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Grand Rapids & Indiana	578[25]	$258,825	$95,706	$382,846	$63,353	$81,667	$10,801	$189,595	$15,703	$361,119	$21,727	.....	$23,641	—$1,914	—$14,685
Grand Trunk Western	347	352,000	132,000	517,794	39,648	79,186	20,537	270,274	14,823	424,468	93,326	—$1,788	29,877	61,661	7,516
Great Northern	7,782[26]	3,278,361	938,034	4,589,743	584,273	752,671	97,928	1,652,401	112,751	3,200,024	1,389,719	—13,745	290,028	1,085,946	—242,813
Gulf & Ship Island	308	129,925	30,054	174,894	21,816	26,832	3,360	45,788	8,150	105,946	68,948	.....	8,726	60,222	10,775
Gulf, Colorado & Santa Fe	1,595[27]	753,639	189,271	1,021,212	172,987	180,988	23,756	418,433	30,008	826,152	195,060	.....	38,407	156,653	—12,388
Houston, East & West Texas	191	80,297	24,238	108,892	22,259	11,548	2,186	41,828	3,842	81,663	28,229	.....	3,833	24,396	—347
Houston & Texas Central	789	347,085	124,734	503,662	87,087	88,381	12,218	232,937	16,013	436,636	67,026	—791	19,957	46,278	116,820
Illinois Central	4,763	3,404,195	1,017,349	5,108,257	533,491	1,052,095	109,354	2,058,037	124,080	3,877,057	1,231,200	1,835	245,750	987,285	408,835
Indiana Harbor Belt	105	.....	.....	268,619	25,119	26,014	2,409	140,327	8,424	202,293	66,326	369	5,500	61,195	—58
International & Great Northern	1,160	592,194	174,802	827,734	105,020	140,926	27,349	400,360	30,455	704,110	123,624	—1,129	30,000	92,495	—50,536
Kanawha & Michigan	177	201,935	26,149	233,319	37,203	55,837	2,291	78,128	6,948	180,407	52,912	—10	8,524	44,378	—8,680
Kansas City Southern	827	609,694	114,926	806,278	68,140	102,398	26,321	301,327	33,798	531,984	274,294	.....	41,142	233,152	4,089
Lake Erie & Western	906[28]	377,870	59,409	464,522	58,075	100,492	11,718	200,495	12,480	383,260	81,262	.....	20,000	61,262	476
Lake Shore & Michigan Southern	1,872[29]	3,259,210	826,660	4,638,644	653,837	898,636	70,518	1,675,181	88,547	3,286,719	1,351,925	—4,176	150,000	1,197,749	143,822
Lehigh & Hudson River	97	128,162	2,974	140,627	9,910	20,288	1,318	58,615	3,374	93,505	47,122	.....	4,000	43,122	—19,764
Lehigh Valley	1,452[30]	2,668,240	281,035	3,071,330	336,014	584,256	68,253	1,131,764	67,070	2,187,357	883,973	—27,338	118,500	738,135	35,922
Long Island	399	233,733	410,065	677,146	115,216	109,373	9,327	395,616	25,949	655,481	21,665	—1,029	59,938	—39,302	9,131
Louisiana & Arkansas	255	112,347	15,569	132,793	20,355	20,051	2,498	36,832	4,590	84,326	48,467	.....	4,500	43,967	—5,329
Louisiana Ry. & Navigation	351	98,253	19,115	127,408	22,253	17,147	5,865	56,469	8,068	109,802	17,606	.....	4,500	13,106	1,648
Louisiana Western	208	127,353	56,931	192,769	28,387	35,666	7,376	70,635	5,834	147,898	44,871	—601	7,260	37,010	—1,814
Louisville & Nashville	4,919[31]	3,508,240	994,678	4,797,819	850,990	906,470	102,973	1,665,715	129,467	3,655,615	1,142,204	6,247	154,741	993,710	—265,115
Louisville, Henderson & St. Louis	200	65,625	23,357	97,452	21,649	11,667	4,195	38,670	2,943	79,124	18,328	192	3,000	15,520	—11,657
Maine Central	1,206[32]	574,784	199,470	824,670	81,858	133,779	4,656	365,711	22,503	608,507	216,163	—6,100	46,737	163,326	—7,009
Michigan Central	1,817	1,867,929	540,563	2,681,351	298,130	478,879	60,922	1,225,208	51,026	2,114,165	567,186	—4,323	116,000	446,863	36,348
Midland Valley	373	63,218	31,688	101,502	24,463	23,929	2,791	38,518	5,117	94,818	6,684	—89	5,964	631	—16,056
Minneapolis & St. Louis	1,586	596,450	122,584	761,175	77,899	102,331	18,264	308,791	20,514	527,799	233,376	—12	33,370	199,994	148,156
Minneapolis, St. Paul & Sault Ste. Marie	3,976[33]	1,658,805	371,622	2,149,915	182,814	335,456	47,341	881,861	55,729	1,503,201	646,714	587	128,190	519,111	115,205
Missouri, Kansas & Texas System	3,817[34]	1,618,674	709,877	2,509,160	341,315	378,486	69,127	1,042,412	91,972	1,923,312	585,848	—3,967	105,572	476,309	77,429
Missouri Pacific	3,920[35]	1,444,209	348,746	1,989,909	208,294	392,900	67,208	939,130	63,043	1,670,575	319,334	—3,742	95,100	220,492	—23,858
Mobile & Ohio	1,114	820,420	105,602	978,824	122,525	183,260	37,941	376,578	32,407	752,711	226,113	—1,812	30,140	194,161	—186
Monongahela	65	142,015	2,411	146,576	11,694	17,060	257	28,693	2,039	59,743	86,833	.....	2,200	84,633	10,911
Morgan's La. & Tex. R. R. & S. S. Co.	404	226,977	93,460	344,936	85,813	50,629	13,232	170,076	13,733	333,483	11,453	—1,965	18,500	—9,012	—73,201
Nashville, Chattanooga & St. Louis	1,231[36]	795,260	230,267	1,100,271	172,394	189,755	39,883	436,845	28,374	867,251	233,020	—222	26,110	206,688	—6,424
Nevada Northern	165	118,307	12,139	133,478	13,059	16,955	396	35,925	3,377	69,712	63,766	.....	6,300	57,466	—3,410
New Orleans & North Eastern	196	228,174	54,006	313,306	29,078	57,618	9,714	121,583	12,148	230,141	83,165	—330	11,250	71,585	—2,194
New Orleans Great Northern	283	119,008	25,977	156,633	21,268	11,069	2,821	45,651	6,749	87,558	69,075	—5	2,523	66,547	30,198
New Orleans, Texas & Mexico	277	110,309	16,840	134,652	18,822	13,396	3,339	63,895	8,111	107,563	27,089	.....	+827	27,916	—2,103
New York Central & Hudson River	3,732[37]	5,172,888	2,188,318	8,251,340	1,048,120	1,653,750	154,544	3,461,023	243,544	6,560,981	1,690,359	5,811	547,005	1,149,165	514,723
New York, Chicago & St. Louis	564[38]	916,953	79,990	1,027,651	84,857	189,454	48,945	497,739	17,694	838,689	188,962	—2,432	32,000	154,530	2,084
New York, New Haven & Hartford	2,091	2,548,094	1,890,629	4,953,554	511,209	816,446	26,075	2,315,600	161,063	3,830,393	1,123,161	—23,825	310,000	789,336	—530,975
New York, Ontario & Western	566	570,230	67,384	669,695	76,026	112,759	10,286	285,844	16,840	501,755	167,940	—4,024	18,166	145,750	—9,650
New York, Philadelphia & Norfolk	112	220,332	29,452	267,813	21,377	52,762	3,590	130,263	12,651	220,643	47,170	.....	8,000	39,170	—8,396
New York, Susquehanna & Western	154[39]	156,657	40,081	227,447	14,099	32,325	2,233	104,210	5,807	158,674	68,773	—18,955	14,673	35,145	—23,741
Norfolk & Western	2,019[40]	2,961,722	311,116	3,411,632	346,377	716,590	58,466	1,123,618	64,527	2,309,578	1,102,054	—1,196	122,000	978,858	143,304
Norfolk Southern	562	204,863	51,602	278,882	30,095	35,456	4,864	96,147	16,242	182,804	96,078	—558	7,509	88,011	12,712
Northern Central	472[41]	785,286	160,386	1,012,996	140,865	240,979	15,819	524,498	27,602	949,763	63,233	168	42,268	21,133	12,499
Northern Pacific	6,240[42]	3,366,786	938,127	4,611,326	548,672	599,960	114,446	1,899,621	73,693	3,236,392	1,374,934	7,054	328,403	1,053,585	—190,974
Northwestern Pacific	401[43]	84,987	123,009	230,605	38,041	41,409	4,037	102,530	13,228	199,245	31,360	.....	12,579	18,781	18,365
Oregon Short Line	1,923[44]	1,171,936	288,913	1,584,501	142,992	203,924	36,179	443,657	51,735	878,487	706,014	—2,660	97,900	605,454	—61,708
Oregon-Washington R. R. & Nav. Co.	1,919[45]	855,009	301,369	1,258,871	167,010	147,740	39,199	558,210	52,112	964,271	294,600	—2,265	96,674	195,661	—51,426
Pecos & Northern Texas	479	142,326	31,920	185,509	21,311	40,313	3,495	78,751	6,030	149,900	35,609	.....	6,325	29,284	—23,554
Pennsylvania *Co.*	1,751[46]	3,271,176	634,870	4,327,191	764,469	976,572	81,990	1,884,284	101,974	3,809,289	517,902	—9,087	236,284	272,531	—200,394
Pennsylvania *Railroad*	4,025[47]	10,225,313	2,574,804	13,718,461	1,856,381	2,979,417	183,833	5,458,891	354,698	10,833,220	2,885,241	—177,442	569,750	2,138,049	—185,097
Peoria & Eastern	352	226,905	48,046	292,993	31,262	65,631	4,931	123,621	5,772	231,217	61,776	.....	10,400	51,376	—1,933
Pere Marquette	2,330	904,320	240,859	1,244,568	182,245	235,054	30,629	555,384	33,390	1,036,702	207,866	20,799	33,023	195,642	331,169
Philadelphia & Reading	1,015	3,237,375	486,729	3,918,388	273,688	709,529	39,060	1,382,873	58,546	2,463,696	1,454,692	39,136	86,530	1,407,298	203,558
Philadelphia, Baltimore & Washington	713	732,956	613,059	1,507,012	264,384	303,877	30,487	706,624	42,261	1,347,633	159,379	.....	49,345	110,034	—51,972
Pittsburgh & Lake Erie	223[48]	1,279,234	121,468	1,455,627	157,085	230,060	11,506	377,997	26,323	802,971	652,656	—608	36,200	615,848	86,861
Pittsburgh, Cincinnati, Chic. & St. Louis	1,472[49]	2,500,064	566,906	3,432,218	455,919	776,207	69,955	1,411,822	73,886	2,787,789	644,429	—1,763	135,877	506,789	—118,300
Pittsburgh, Shawmut & Northern	279[50]	176,759	7,387	186,461	35,241	42,451	1,036	62,222	3,841	144,791	41,670	.....	1,576	40,094	—23,982
Port Reading	21	125,898	.....	128,606	7,167	28	30	41,539	110	48,874	79,732	5,392	8,000	77,124	—5,689
Richmond, Fredericksburg & Potomac	88[51]	116,115	98,083	241,684	17,383	22,694	2,803	39,798	7,084	139,762	101,922	—176	722	101,024	15,425
Rutland	468	136,673	70,684	239,248	27,057	52,815	6,639	114,467	6,392	207,370	31,878	.....	17,608	14,270	—2,809
St. Joseph & Grand Island	319	64,550	25,166	100,419	17,432	18,959	4,798	54,640	5,142	100,971	—552	268	6,244	—6,528	—12,038
St. Louis & San Francisco	4,742[52]	2,267,621	764,198	3,273,751	259,462	451,994	86,939	1,246,645	98,334	2,143,374	1,130,377	.....	163,199	967,178	106,006
St. Louis, Brownsville & Mexico	518[53]	130,302	79,480	227,194	38,905	27,428	4,020	118,522	10,586	199,461	27,733	.....	5,500	22,233	—18,909
St. Louis, Iron Mountain & Southern	3,365[54]	1,979,994	486,602	2,691,743	306,181	373,451	63,639	881,386	66,443	1,691,100	1,000,643	—3,128	88,695	908,820	36,399
St. Louis Merchants' Bridge Terminal	9	.....	360	168,795	36,014	10,845	748	100,066	6,426	154,099	14,696	.....	5,600	9,096	—24,809

Average mileage operated during previous period—[25] 586; [26] 7,345; [27] 1,597; [28] 886; [29] 1,775; [30] 1,450; [31] 4,705; [32] 1,204; [33] 3,770; [34] 3,399; [35] 3,915; [36] 1,230; [37] 3,597; [38] 562; [39] 152; [40] 2,014; [41] 473; [42] 6,034; [43] 404; [44] 1,762; [45] 1,920; [46] 1,760; [47] 4,018; [48] 215; [49] 1,467; [50] 278; [51] 83; [52] 4,732; [53] 510; [54] 3,314. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF FEBRUARY, 1913.—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
St. Louis, San Francisco & Texas	244	$82,170	$20,459	$115,540	$17,472	$14,655	$2,372	$51,456	$6,431	$92,386	$23,154	.....	$1,225	$21,929	$19,822
St. Louis Southwestern	906[55]	557,627	108,007	703,851	11,537	83,970	30,310	204,015	25,158	354,990	348,861	—$1,332	26,796	320,733	53,336
St. Louis Southwestern of Texas	703	242,544	68,880	336,233	79,395	66,895	14,030	173,235	19,373	352,928	—16,695	—152	11,228	—28,075	16,786
San Antonio & Aransas Pass	727	222,721	92,810	336,227	72,986	56,544	5,642	165,764	11,483	312,419	23,808	.....	11,000	12,808	—39,316
San Pedro, Los Angeles & Salt Lake	1,135[56]	492,361	246,805	797,570	83,272	146,532	32,301	262,426	18,524	543,055	254,515	—952	34,007	219,556	83,629
Seaboard	3,070	1,479,173	471,360	2,161,399	259,482	302,197	66,068	774,234	51,468	1,453,449	707,950	186	81,000	627,136	115,108
Southern	7,037[57]	3,605,174	1,257,844	5,286,575	740,078	862,014	180,071	1,970,961	163,249	3,916,373	1,370,202	5,564	204,565	1,171,201	—60,866
Southern in Mississippi	281	43,626	17,630	67,344	31,524	7,269	2,496	40,080	4,273	85,642	—18,298	.....	8,081	—26,379	—44,971
Southern Kansas of Texas	125	84,455	15,076	103,806	12,958	23,796	2,082	35,656	3,584	78,076	25,730	.....	2,328	23,402	5,436
Southern Pacific Co	6,323[58]	3,934,936	2,319,367	6,739,731	830,501	1,051,425	181,731	2,135,640	225,432	4,424,729	2,315,002	103,022	373,451	2,044,573	—255,785
Spokane, Portland & Seattle	556[59]	215,442	96,515	337,109	52,596	37,053	6,163	108,119	13,770	217,701	119,408	—1,155	53,400	64,853	—45,431
Tennessee Central	294	92,594	29,699	130,791	23,336	14,853	4,882	47,064	7,761	97,896	32,895	.....	4,265	28,630	30,904
Terminal R. R. Ass'n of St. Louis	34[60]	.....	277	236,351	36,201	17,014	972	101,657	6,383	162,227	74,124	8,651	25,560	57,215	—16,265
Texas & New Orleans	458	230,978	89,245	342,202	87,735	71,519	8,690	126,702	11,937	306,583	35,619	—1,405	12,672	21,542	13,993
Texas & Pacific	1,885	929,987	306,041	1,324,284	170,975	228,047	32,785	658,678	43,248	1,133,733	190,551	—1,335	48,648	140,568	30,181
Toledo & Ohio Central	443	335,962	42,776	395,671	63,232	73,838	6,829	162,884	9,141	315,924	79,747	—517	21,604	57,626	12,175
Toledo, Peoria & Western	248	71,236	32,895	110,138	19,139	25,030	1,929	42,846	3,431	92,375	17,763	.....	5,900	11,863	—5,761
Toledo, St. Louis & Western	451	319,523	21,376	360,835	30,848	44,687	15,320	138,529	8,596	237,980	122,855	.....	15,000	107,855	60,134
Trinity & Brazos Valley	463	164,163	52,275	225,808	48,148	36,056	11,315	129,149	14,130	238,798	—12,990	.....	3,500	—16,490	—59,171
Union Pacific	3,576[61]	2,433,353	667,179	3,504,652	292,817	472,352	86,296	1,079,456	116,778	2,047,699	1,456,953	—10,395	168,350	1,278,208	155,583
Union R. R. of Baltimore	9	129,919	20,714	152,330	7,183	.....	1,140	5,174	2,958	16,455	135,875	.....	5,527	130,348	33,753
Union R. R. of Pennsylvania	31	.....	.....	251,552	29,156	91,219	112	145,932	2,692	269,111	—17,559	—599	8,500	—26,658	—21,782
Vandalia	827	178,973	178,235	870,712	111,014	190,130	24,106	365,560	17,800	910,610	160,102	.....	30,316	129,786	—28,009
Vicksburg, Shreveport & Pacific	171	82,997	34,926	131,228	22,520	27,882	3,650	49,902	5,001	108,955	22,273	—131	6,900	15,242	—14,558
Virginia & Southwestern	240	129,830	11,776	145,116	21,095	30,400	1,840	40,124	3,445	96,904	48,212	.....	7,232	40,980	344
Virginian	503[62]	506,751	22,661	541,762	59,543	97,559	4,918	126,169	8,852	297,041	244,721	5,830	17,600	232,951	103,615
Washington Southern	36	34,224	47,999	108,850	11,173	15,778	1,334	45,432	3,079	76,796	32,054	—160	3,290	28,604	—1,262
West Jersey & Seashore	356	120,982	197,264	340,588	73,629	65,485	10,146	192,600	13,316	355,176	—14,588	—6,246	25,336	—46,170	2,526
Western Pacific	937	341,941	69,384	422,148	69,355	37,856	26,702	191,274	24,619	349,806	72,342	—2,131	25,741	44,470	63,205
Western Rv. of Alabama	133	75,254	41,524	122,353	17,555	22,714	5,579	34,129	5,701	85,678	36,675	29	4,929	31,775	7,076
Wheeling & Lake Erie	459[63]	467,279	37,013	538,281	54,373	129,919	7,433	216,391	18,734	426,850	111,431	1,265	29,177	83,519	—67,500
Yazoo & Mississippi Valley	1,374	604,301	172,854	847,082	174,797	145,992	14,076	377,316	24,845	737,026	110,056	419	37,000	73,475	—46,201
EIGHT MONTHS OF FISCAL YEAR, 1913															
Alabama & Vicksburg	143	$822,534	$335,982	$1,243,495	$189,975	$225,561	$29,053	$428,498	$45,265	$918,352	$325,143	—$1,434	$48,386	$275,323	$31,045
Ann Arbor	292	914,992	386,158	1,395,072	185,821	183,561	33,297	497,827	59,028	959,534	435,538	—4,405	111,439	319,694	—74,740
Arizona Eastern	366	1,356,406	301,171	1,753,349	185,474	129,121	20,290	442,217	68,117	845,219	908,130	582	68,742	839,970	314,993
Atchison, Topeka & Santa Fe	8,242[1]	44,367,384	17,220,665	66,716,477	11,031,164	11,089,788	1,374,133	19,040,721	1,301,412	43,837,218	22,879,259	.....	2,719,268	20,159,991	2,354,235
Atlantic & St. Lawrence	167	809,820	218,568	1,120,398	208,277	176,660	36,682	586,844	31,355	1,039,818	80,580	.....	85,025	—4,445	27,515
Atlanta, Birmingham & Atlantic	645[2]	1,581,117	459,374	2,182,604	357,536	343,987	125,753	861,466	92,718	1,781,460	401,144	.....	107,850	293,294	—172,192
Atlanta & West Point	93	435,155	335,753	852,493	105,359	152,141	43,049	276,330	40,264	617,143	235,350	1,226	50,751	185,825	—32,804
Atlantic City	167	507,209	893,004	1,484,750	237,284	108,917	22,719	767,216	11,430	1,147,566	337,184	—29,847	72,000	235,337	—74,521
Atlantic Coast Line	4,613[3]	15,852,320	6,005,328	23,594,040	3,203,453	3,610,710	412,007	8,256,700	612,095	16,094,965	7,499,075	.....	982,090	6,516,985	204,018
Baltimore & Ohio—System	4,455[4]	53,808,983	10,482,652	68,216,212	9,138,126	12,082,110	1,314,490	24,630,083	1,324,756	48,489,565	19,726,647	—578,627	1,886,203	17,261,817	1,777,896
Baltimore & Ohio Chicago Terminal	77	.....	16,226	1,203,286	164,361	189,261	5,711	552,420	36,363	948,116	255,170	7,039	152,922	109,287	75,780
Bangor & Aroostook	631[5]	1,469,036	428,383	2,016,660	362,221	258,899	27,051	698,926	97,818	1,441,915	574,745	.....	84,000	490,745	—238,593
Belt Ry. Co. of Chicago	21	.....	.....	2,121,648	127,207	278,292	3,925	909,542	43,981	1,362,947	758,701	.....	62,590	696,111	66,654
Bessemer & Lake Erie	204	5,517,504	255,576	5,860,522	632,207	1,079,215	74,978	1,439,510	91,103	3,317,013	2,543,509	.....	90,000	2,453,509	268,292
Boston & Maine	2,244	19,319,983	11,061,730	32,886,120	3,931,083	5,002,839	279,029	15,469,667	803,377	25,485,995	7,400,125	121,587	1,440,664	6,081,048	104,266
Buffalo & Susquehanna *R. R.*	265	1,104,162	67,685	1,205,767	232,557	179,640	9,605	413,834	47,144	882,780	322,987	.....	17,600	305,387	93,071
Buffalo & Susquehanna *Ry.*	91	334,109	77,244	430,680	91,008	222,063	3,739	181,054	21,197	519,061	—88,381	119	12,400	—100,662	—33,361
Buffalo, Rochester & Pittsburgh	574[6]	6,249,306	771,789	7,289,558	1,027,391	1,445,594	93,596	2,373,471	149,408	5,089,460	2,200,098	—3,227	140,000	2,056,871	127,545
Butte, Anaconda & Pacific	46	701,427	91,856	871,947	111,318	179,007	5,916	429,232	23,708	749,181	122,766	.....	16,639	106,127	—41,647
Canadian Pacific Lines in Maine	233	602,074	214,138	881,320	234,692	130,247	47,062	383,143	41,145	836,289	45,031	.....	80,000	—34,969	—31,545
Carolina, Clinchfield & Ohio	238	1,469,732	122,606	1,627,179	110,632	167,126	54,497	281,357	59,278	672,890	954,289	.....	64,000	890,289	189,149
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	89,350	13,349	104,556	6,661	722	8,437	20,382	3,502	39,704	64,852	.....	4,000	60,852	13,609
Central of Georgia	1,915	6,052,329	2,682,722	9,571,937	1,368,001	1,722,623	283,528	3,246,912	311,445	6,932,509	2,639,428	49,573	402,950	2,286,051	—289,533
Central of New Jersey	676[7]	14,531,721	3,737,418	19,334,796	1,645,564	2,766,324	241,960	5,694,888	340,965	10,689,701	8,645,095	22,798	994,167	7,673,726	820,734
Central New England	277	2,130,989	234,830	2,484,443	337,695	225,220	9,457	695,876	28,715	1,296,963	1,187,480	—3,597	80,000	1,103,883	68,109
Central Vermont	411	1,799,869	773,844	2,790,555	325,949	495,243	65,856	1,395,812	70,197	2,353,057	437,498	1,537	105,471	333,564	—90,012
Charleston & Western Carolina	341	945,385	251,807	1,261,970	227,406	200,133	26,283	476,428	37,578	967,828	294,142	.....	40,000	254,142	—41,966
Chesapeake & Ohio Lines	2,324[8]	18,802,118	3,959,670	23,822,181	2,745,574	5,059,206	449,095	7,488,197	525,882	16,267,954	7,554,227	28,868	867,240	6,715,855	—231,407
Chicago & Alton	1,026	6,814,596	2,894,429	10,493,335	1,585,626	2,418,749	346,601	3,850,701	264,652	8,466,329	2,027,006	—18,672	307,700	1,700,634	—463,970
Chicago & Eastern Illinois	1,275	8,144,847	2,081,023	11,098,702	1,361,718	2,263,647	202,214	4,125,838	334,650	8,293,067	2,805,635	—21,783	351,045	2,432,807	—195,753
Chicago & Erie	270	2,916,470	501,189	3,770,209	649,056	799,391	167,611	1,918,836	88,709	3,623,603	146,606	—8,891	105,352	32,363	—249,842
Chicago & Northwestern	7,976[9]	37,038,875	14,159,805	56,365,266	7,039,964	7,907,395	917,001	21,669,611	1,035,514	38,569,485	17,795,781	12,663	2,424,000	15,384,444	3,945,930
Chicago, Burlington & Quincy	9,129[10]	44,255,314	15,240,919	65,372,143	6,507,532	10,667,836	1,046,396	20,224,548	1,715,223	40,161,535	25,210,608	—105,844	2,272,949	22,831,815	4,195,844

Average mileage operated during previous period—[55] 843; [56] 1,116; [57] 7,089; [58] 6,203; [59] 551; [60] 35; [61] 3,537; [62] 475; [63] 457; [1] 8,201; [2] 662; [3] 4,526; [4] 4,434; [5] 628; [6] 572; [7] 672; [8] 2,281; [9] 7,928; [10] 9,074.
— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

EIGHT MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Chicago Great Western	1,496	$6,579,019	$2,161,090	$9,455,443	$1,069,989	$1,334,199	$370,819	$3,706,898	$275,587	$6,757,492	$2,697,951	$129	$282,267	$2,415,813	$621,835
Chicago, Indiana & Southern	359	2,657,704	205,984	2,959,747	375,125	732,200	64,363	997,219	74,409	2,243,316	716,431	3,478	134,271	585,638	291,741
Chicago, Indianapolis & Louisville	617	3,092,576	1,137,011	4,657,596	656,924	634,441	143,805	1,746,643	119,895	3,301,708	1,355,888	.....	185,341	1,170,547	70,036
Chicago Junction	12	.....	.....	1,313,830	141,401	95,913	9,264	633,144	28,602	908,324	405,506	.....	13,099	392,407	45,490
Chicago, Milwaukee & St. Paul	9,592[11]	46,521,249	12,620,999	64,350,302	6,886,328	9,120,056	1,283,096	23,773,253	814,099	41,876,832	22,473,470	130,906	2,521,727	20,082,649	7,829,479
Chicago, Peoria & St. Louis†	255	202,037	43,355	260,347	34,535	44,640	14,522	136,308	14,546	244,551	15,796	.....	8,600	7,196	—4,851
Chicago, Rock Island & Gulf	477	1,717,616	483,889	2,342,364	263,877	207,845	81,796	809,509	64,917	1,427,944	914,420	—4,986	57,005	852,429	146,983
Chicago, Rock Island & Pacific	7,566[12]	30,448,965	13,208,901	46,473,752	6,808,606	6,619,557	1,255,996	18,546,571	1,106,312	34,337,042	12,136,710	—130,632	1,908,541	10,097,537	1,166,767
Chicago, St. Paul, Minneapolis & Omaha	1,744	7,498,480	3,465,010	11,739,351	1,471,332	1,490,336	231,567	4,611,254	258,883	8,063,372	3,675,979	—2,548	559,689	3,113,742	520,435
Chicago, Terre Haute & Southeastern	351	1,165,308	143,550	1,341,885	209,065	256,205	24,787	428,423	61,317	979,797	362,088	—1,517	80,000	280,571	—80,254
Cincinnati, Hamilton & Dayton	1,015	5,231,315	1,128,740	7,088,544	809,898	1,228,938	159,097	2,959,250	155,670	5,312,853	1,775,691	.....	285,525	1,490,166	—8,868
Cincinnati Northern	245	801,045	149,248	998,199	147,266	194,256	21,085	401,923	26,328	790,858	207,341	.....	43,862	163,479	71,556
Cleveland, Cincinnati, Chic. & St. Louis	2,014[13]	16,002,798	5,463,468	23,403,948	2,635,898	4,306,291	562,872	9,004,044	461,831	16,970,936	6,433,012	—10,717	827,843	5,594,452	877,832
Colorado Midland	338	1,048,197	188,475	1,361,111	168,578	273,045	56,730	588,404	44,852	1,131,609	229,502	746	69,600	160,648	—34,049
Colorado & Southern	1,069[14]	4,634,861	982,335	6,001,628	769,410	1,321,440	83,866	1,783,003	174,960	4,132,679	1,868,949	—6,140	234,559	1,628,250	—34,660
Cumberland Valley	162	1,738,505	479,552	2,324,760	413,788	279,534	35,846	769,841	65,392	1,564,401	760,359	251	48,431	712,179	139,090
Delaware & Hudson Co.—R. R. Dept	854[15]	13,606,577	2,183,455	16,333,154	1,287,934	2,310,620	189,244	5,474,072	447,594	9,709,464	6,623,690	—62,236	405,266	6,156,188	477,761
Delaware, Lackawanna & Western	958	20,200,494	5,467,355	27,485,177	3,052,537	4,099,612	527,842	8,348,655	527,804	16,556,450	10,928,727	422,912	1,088,340	10,263,299	1,805,689
Denver & Rio Grande	2,550[16]	12,714,467	3,601,162	17,067,588	2,091,515	3,016,978	374,950	5,520,360	457,531	11,461,334	5,606,254	4,123	643,300	4,967,077	1,103,441
Denver, Northwestern & Pacific	215	561,601	211,224	809,283	122,730	132,252	15,301	267,532	38,232	576,047	233,236	.....	28,000	205,236	—30,698
Detroit & Mackinac	411[17]	509,547	235,468	803,664	119,052	112,019	18,045	294,292	23,399	566,807	236,857	1,214	69,961	168,110	30,736
Detroit & Toledo Shore Line	79	901,624	.....	904,839	104,699	48,729	9,702	249,903	18,685	431,718	473,121	.....	40,392	432,729	60,914
Detroit, Grand Haven & Milwaukee	191	1,020,997	452,284	1,704,160	432,292	212,801	56,383	864,025	39,707	1,605,208	98,952	—516	23,625	74,811	—162,249
Detroit River Tunnel	2	.....	.....	822,155	17,516	22,288	.....	68,788	344	108,936	713,219	.....	37,507	675,512	—87,112
Detroit, Toledo & Ironton	441	973,800	110,266	1,170,356	254,182	184,218	21,569	574,212	42,272	1,076,453	93,903	—12	47,000	46,891	—85,875
Duluth & Iron Range	272[18]	4,510,069	170,495	4,755,096	560,717	465,106	7,613	1,045,349	102,827	2,181,612	2,573,484	18,895	229,909	2,362,470	—23,790
Duluth, Missabe & Northern	356[19]	5,153,375	295,462	5,509,148	593,371	637,975	16,524	1,096,040	107,459	2,451,369	3,057,779	17,110	263,084	2,811,805	409,490
Duluth, South Shore & Atlantic	627[20]	1,450,565	656,900	2,217,351	455,155	262,462	78,952	877,251	84,572	1,758,392	458,959	5,371	143,914	320,416	—103,500
El Paso & Southwestern Co	974[21]	4,750,561	725,178	5,731,914	643,136	763,877	108,767	1,550,411	209,943	3,276,134	2,455,780	—15,749	238,953	2,201,078	437,816
Elgin, Joliet & Eastern	814[22]	8,098,794	55	8,756,098	916,214	1,320,947	38,982	2,434,224	144,386	4,854,753	3,901,345	.....	207,053	3,694,292	1,239,019
Erie	1,988[23]	27,058,754	6,367,604	36,329,844	4,040,505	6,385,073	769,945	12,056,965	695,862	23,948,350	12,381,494	—241,579	1,179,814	10,960,101	1,275,602
Florida East Coast	642[24]	1,508,033	1,189,842	3,083,183	522,022	456,358	64,151	1,143,222	95,270	2,281,023	802,160	—10,721	127,000	664,439	157,686
Fort Worth & Denver City	454	2,489,963	1,104,039	3,771,338	364,332	641,628	55,449	1,239,382	117,437	2,418,228	1,353,110	—4,201	88,373	1,260,536	48,959
Galveston, Harrisburg & San Antonio	1,338	5,746,438	2,144,508	8,325,384	801,692	1,750,674	268,938	3,262,083	247,338	6,330,725	1,994,659	—33,388	255,981	1,705,290	204,181
Georgia, Southern & Florida	395	916,918	582,030	1,716,807	205,856	322,010	61,533	688,616	74,877	1,352,892	363,915	.....	91,307	272,608	—55,329
Grand Rapids & Indiana	578[25]	2,188,812	1,268,879	3,753,241	480,812	576,070	92,812	1,559,612	125,405	2,834,711	918,530	180	190,501	728,209	83,740
Grand Trunk Western	347	3,055,840	1,535,009	4,898,891	549,714	681,376	172,435	2,056,187	128,071	3,587,783	1,311,108	—11,907	239,017	1,060,184	48,988
Great Northern	7,783[26]	39,730,351	10,130,083	53,290,953	6,772,174	6,248,538	788,064	14,302,148	860,636	28,971,560	24,319,393	113,579	2,527,976	21,904,996	2,878,975
Gulf & Ship Island	308	1,000,008	282,552	1,379,829	189,873	244,618	22,322	365,969	66,542	889,324	490,505	.....	51,955	438,550	29,573
Gulf, Colorado & Santa Fe	1,595[27]	7,078,022	2,100,249	9,723,953	1,529,518	1,381,236	194,227	3,437,109	271,607	6,813,697	2,910,256	.....	320,275	2,589,981	649,220
Houston, East & West Texas	191	636,217	241,449	929,204	198,219	124,544	16,949	303,516	30,160	673,388	255,816	.....	28,407	227,409	—24,307
Houston & Texas Central	789	3,153,893	1,301,348	4,763,833	645,150	811,807	137,457	1,861,138	135,532	3,591,084	1,172,749	—10,705	153,437	1,008,607	332,554
Illinois Central	4,763	38,733,822	9,319,625	43,622,035	5,794,174	9,286,104	911,293	16,801,035	1,006,469	33,799,075	9,822,960	—61,487	1,910,000	7,851,473	3,026,703
Indiana Harbor Belt	105	.....	.....	2,134,483	231,613	254,531	21,391	928,027	52,544	1,488,106	646,377	—17,250	44,553	619,074	179,522
International & Great Northern	1,160	5,893,752	1,793,905	8,175,451	1,050,718	1,081,564	211,299	3,256,355	257,595	5,857,531	2,317,920	—16,714	240,000	2,061,206	.....
Kanawha & Michigan	177	1,896,583	256,492	2,200,792	301,744	400,992	18,681	631,825	51,633	1,404,875	795,917	—144	71,475	724,298	—33,355
Kansas City Southern	827	5,363,981	1,143,054	7,210,763	686,684	896,999	207,468	2,366,272	259,769	4,417,192	2,793,571	.....	300,772	2,492,799	675,248
Lake Erie & Western	906[28]	3,285,846	616,815	4,129,371	573,926	739,302	96,855	1,560,660	92,314	3,063,057	1,066,314	.....	163,130	903,184	148,459
Lake Shore & Michigan Southern	1,872[29]	26,118,086	8,388,574	38,755,433	4,602,348	6,573,699	650,859	12,310,871	649,560	24,787,337	13,968,096	104,313	1,231,098	12,841,311	1,497,345
Lehigh & Hudson River	97	1,138,818	33,267	1,216,451	152,482	176,496	10,561	435,452	34,306	809,297	407,154	.....	32,000	375,154	12,580
Lehigh Valley	1,452[30]	24,759,093	3,258,278	29,010,624	3,938,122	4,816,707	632,795	9,293,375	554,205	19,235,204	9,775,420	—116,124	942,000	8,717,296	1,339,861
Long Island	399	2,323,374	4,975,749	7,673,259	1,018,888	864,198	114,592	3,323,293	189,340	5,510,311	2,162,948	407,986	467,438	2,103,496	278,312
Louisiana & Arkansas	255	889,163	163,255	1,093,330	173,194	168,008	19,582	300,114	39,121	700,019	393,311	.....	32,902	360,409	74,787
Louisiana Ry. & Navigation	351	995,217	199,600	1,277,507	176,144	149,632	47,231	508,025	52,156	933,188	344,319	.....	42,000	302,319	—25,500
Louisiana Western	208	993,458	464,366	1,524,014	188,830	262,044	56,553	469,189	45,527	1,022,143	501,871	99	61,176	440,794	139,227
Louisville & Nashville	4,919[31]	28,759,462	8,705,377	39,941,712	6,615,874	7,537,532	838,313	12,985,759	920,907	28,898,385	11,043,327	—7,161	1,234,933	9,801,233	—796,119
Louisville, Henderson & St. Louis	200	517,651	254,328	828,923	221,537	107,658	35,191	309,881	25,032	699,299	129,624	1,907	24,000	107,531	—94,278
Maine Central	1,206[32]	4,670,254	2,421,559	7,553,740	1,185,171	1,036,255	78,570	2,822,617	197,698	5,320,311	2,233,429	—25,466	350,818	1,857,145	147,325
Michigan Central	1,817	15,071,872	5,849,823	23,257,097	2,727,628	3,401,302	530,122	9,222,587	409,997	16,291,636	6,965,461	25,110	902,985	6,087,586	165,241
Midland Valley	373	661,960	325,083	1,041,118	254,273	171,794	21,041	340,252	44,290	831,650	209,468	1,904	47,741	163,631	—34,194
Minneapolis & St. Louis	1,586	5,078,658	1,281,713	6,739,972	858,017	843,907	141,801	2,577,976	167,311	4,589,012	2,150,960	—263	251,437	1,899,260	983,414
Minneapolis, St. Paul & Sault Ste. Marie	3,976[33]	15,757,640	4,597,176	21,469,885	2,131,102	2,563,118	428,092	6,637,704	435,542	12,195,558	9,274,327	120,006	1,140,025	8,254,308	2,261,203
Missouri, Kansas & Texas System	3,817[34]	15,012,380	6,458,669	22,790,995	3,016,869	2,785,426	501,431	8,205,483	692,555	15,201,764	7,589,231	—41,352	871,023	6,676,856	2,131,508
Missouri Pacific	3,920[35]	14,260,487	3,516,665	19,353,609	2,945,657	3,428,969	489,014	8,021,528	538,118	15,423,286	3,930,323	—24,450	758,430	3,147,443	1,951,720
Mobile & Ohio	1,114	6,686,173	1,010,103	8,167,992	947,285	1,542,456	300,348	2,916,709	251,474	5,958,272	2,209,720	—11,649	239,984	1,958,087	38,985
Monongahela	65	1,083,709	19,768	1,117,562	126,679	80,789	2,726	213,188	16,178	439,560	678,002	.....	18,443	659,559	213,751
Morgan's La. & Tex. R. R. & S. S. Co.	404	2,232,899	765,217	3,174,329	574,499	497,564	102,897	1,319,622	89,640	2,584,222	590,107	—15,264	149,289	425,554	—403,326

†Figures shown here are for period January 1 to February 28, 1913.
Average mileage operated during previous period—[11] 9,570; [12] 7,551; [13] 2,012; [14] 1,053; [15] 852; [16] 2,545; [17] 358; [18] 274; [19] 342; [20] 624; [21] 902; [22] 841; [23] 1,995; [24] 630; [25] 586; [26] 7,345; [27] 1,597; [28] 886; [29] 1,775; [30] 1,450; [31] 4,705; [32] 1,204; [33] 3,770; [34] 3,399; [35] 3,915. —Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

EIGHT MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Nashville, Chattanooga & St. Louis	1,231[36]	$6,144,408	$2,117,499	$8,869,959	$1,367,539	$1,564,451	$316,620	$3,381,850	$233,196	$6,863,656	$2,006,303	—$4,758	$204,022	$1,797,523	$103,583
Nevada Northern	165	908,187	123,014	1,060,252	119,053	122,907	3,297	235,112	27,737	508,106	552,146	.....	49,306	502,840	52,748
New Orleans & North Eastern	196	1,829,121	438,857	2,456,967	257,405	472,094	78,965	958,095	98,586	1,865,145	591,822	—459	99,932	491,431	—130,856
New Orleans Great Northern	283	816,180	240,040	1,145,825	176,423	118,150	19,819	342,331	53,030	709,753	436,072	—466	17,385	418,221	87,496
New Orleans, Texas & Mexico	277	861,527	144,161	1,084,949	188,235	94,996	26,832	470,244	51,517	831,824	253,125	.....	16,280	236,845	80,507
New York Central & Hudson River	3,732[37]	45,379,605	22,752,226	76,039,196	10,137,243	13,941,873	1,455,733	27,432,298	1,850,012	54,817,159	21,222,037	321,798	4,092,943	17,450,892	1,689,315
New York, Chicago & St. Louis	564[38]	7,276,061	1,073,312	8,644,292	829,918	1,123,341	411,503	3,601,843	136,078	6,102,683	2,541,609	—13,751	265,583	2,262,275	262,840
New York, New Haven & Hartford	2,091	23,113,841	18,764,879	46,277,229	5,127,901	6,052,873	247,583	18,073,553	1,278,355	30,780,265	15,496,964	740,318	2,585,000	13,652,282	101,460
New York, Ontario & Western	566	4,899,561	1,211,271	6,425,181	796,840	985,845	88,352	2,349,709	134,000	4,354,746	2,070,435	—4,451	145,333	1,920,651	394,114
New York, Philadelphia & Norfolk	112	1,885,231	340,799	2,411,590	193,820	429,411	31,955	1,047,037	101,480	1,803,703	607,887	.....	63,400	544,487	32,130
New York, Susquehanna & Western	154[39]	1,308,515	385,670	1,920,091	221,299	242,721	15,425	825,680	38,422	1,343,547	576,544	—24,218	126,309	426,017	—230,101
Norfolk & Western	2,019[40]	25,190,770	3,223,747	29,374,140	3,630,963	5,416,672	450,471	8,602,737	536,595	18,637,438	10,736,702	—20,634	964,000	9,752,068	1,446,748
Norfolk Southern	562	1,443,465	551,626	2,184,595	264,710	293,922	38,826	689,288	121,446	1,408,192	776,403	—9,312	60,078	707,013	54,237
Northern Central	472[41]	6,685,417	1,628,887	8,895,566	1,043,740	1,731,803	127,324	4,225,588	212,720	7,341,175	1,554,391	5,094	332,095	1,227,390	332,383
Northern Pacific	6,240[42]	35,959,415	10,641,346	49,567,381	6,243,483	5,579,630	829,047	15,851,230	690,457	29,193,847	20,373,534	276,068	2,549,957	18,099,645	2,491,878
Northwestern Pacific	401[43]	986,794	1,328,897	2,497,353	355,079	309,001	29,355	904,180	104,614	1,702,229	795,124	.....	100,632	694,492	75,588
Oregon Short Line	1,923[44]	11,097,928	3,319,697	15,344,227	1,520,385	1,656,535	243,486	3,813,742	537,723	7,571,871	7,772,356	6,348	1,028,077	6,750,627	520,422
Oregon-Washington R. R. & Nav. Co.	1,919[45]	8,129,507	3,434,452	12,369,425	1,587,201	1,340,174	365,614	4,480,815	385,709	8,159,513	4,209,912	—28,261	766,766	3,414,885	344,735
Pecos & Northern Texas	479	1,294,168	342,112	1,749,398	207,377	329,517	29,053	551,158	49,950	1,167,055	582,343	.....	38,910	543,433	224,661
Pennsylvania *Co.*	1,751[46]	33,996,684	6,632,779	44,820,242	6,963,228	8,102,287	664,104	15,423,618	800,988	31,954,225	12,866,017	—32,194	1,946,579	10,887,244	1,907,702
Pennsylvania *Railroad*	4,025[47]	88,272,568	24,615,224	120,987,633	15,504,793	25,495,139	1,545,755	43,219,358	2,791,533	88,556,578	32,431,055	—757,302	4,942,105	26,731,648	2,483,749
Peoria & Eastern	352	856,026	497,529	2,507,518	293,150	463,223	36,621	930,571	46,017	1,769,582	737,936	.....	89,548	648,388	144,667
Pere Marquette	2,330	8,080,997	2,849,256	11,909,609	1,772,324	2,017,523	269,092	4,887,797	286,014	9,232,750	2,676,859	28,222	424,834	2,280,247	446,999
Philadelphia & Reading	1,015	27,782,340	4,748,312	34,192,331	3,008,499	5,513,198	332,960	10,791,399	488,100	20,134,156	14,058,175	282,651	690,391	13,650,435	2,876,819
Philadelphia, Baltimore & Washington	713	6,919,605	5,582,163	13,919,899	2,287,639	2,457,673	226,794	5,765,129	349,525	11,086,760	2,833,139	.....	436,034	2,397,105	—187,241
Pittsburgh & Lake Erie	223[48]	11,517,522	1,157,174	13,149,564	1,262,317	1,918,281	113,083	2,914,895	203,703	6,412,279	6,737,285	—2,494	259,189	6,475,602	1,614,300
Pittsburgh, Cincinnati, Chic. & St. Louis	1,472[49]	21,785,714	5,644,318	30,612,292	4,539,346	5,879,877	567,786	10,949,861	571,022	22,507,892	8,104,400	—6,681	1,124,585	6,973,134	478,227
Pittsburgh, Shawmut & Northern	279[50]	1,207,200	75,729	1,303,788	196,425	284,211	9,391	411,458	30,730	932,215	371,573	.....	12,701	358,872	20,738
Port Reading	21	1,068,263	.....	1,089,383	76,821	2,506	243	289,786	1,242	370,598	718,785	52,762	64,000	707,547	183,812
Richmond, Fredericksburg & Potomac	88[51]	968,524	648,074	1,850,722	193,180	216,076	23,609	674,348	54,544	1,161,757	688,965	—1,219	5,910	681,836	129,365
Rutland	468	1,344,383	838,861	2,503,743	299,331	489,423	65,717	995,759	52,213	1,902,443	601,300	.....	112,373	488,927	—72,941
St. Joseph & Grand Island	319	710,345	273,061	1,079,799	218,254	154,338	38,976	474,923	44,149	930,640	149,159	—1,044	49,042	99,073	—14,951
St. Louis & San Francisco	4,742[52]	20,005,404	7,560,789	29,567,709	3,596,370	3,791,894	633,686	10,403,361	808,984	19,234,295	10,333,414	.....	1,353,083	8,980,331	1,002,863
St. Louis, Brownsville & Mexico	518[53]	1,155,833	613,205	1,891,655	305,484	207,161	37,511	890,549	74,906	1,515,611	376,044	.....	46,447	329,597	—101,488
St. Louis, Iron Mountain & Southern	3,365[54]	17,210,119	4,446,445	23,301,387	3,914,948	3,401,193	441,223	7,268,029	547,581	15,572,974	7,728,413	—36,100	720,060	6,972,253	1,167,039
St. Louis Merchants' Bridge Terminal	9	.....	2,922	1,439,588	237,845	68,701	5,485	725,750	50,382	1,088,163	351,425	.....	46,850	304,575	135,134
St. Louis, San Francisco & Texas	244	760,198	247,767	1,073,883	180,070	128,268	20,048	422,726	44,558	795,670	278,213	.....	8,438	269,775	122,816
St. Louis Southwestern	906[55]	4,515,652	1,061,243	5,867,151	630,769	807,113	236,577	1,378,692	207,375	3,260,526	2,606,625	—6,401	198,018	2,402,206	381,905
St. Louis Southwestern of Texas	703	2,382,317	799,902	3,393,362	634,284	632,070	108,453	1,332,118	158,136	2,865,061	528,301	—1,596	86,163	440,542	—75,075
San Antonio & Aransas Pass	727	2,507,682	970,857	3,649,527	537,615	441,171	48,659	1,329,055	85,005	2,441,505	1,208,022	.....	95,000	1,113,022	159,616
San Pedro, Los Angeles & Salt Lake	1,135[56]	4,252,389	2,081,539	6,818,163	751,990	1,140,572	245,841	2,180,524	152,658	4,471,585	2,346,578	—13,217	263,341	2,070,020	1,419,964
Seaboard	3,070	10,871,655	3,500,064	15,981,179	2,183,921	2,200,914	507,993	5,781,715	453,489	11,128,032	4,853,147	—18,033	648,000	4,187,114	498,130
Southern	7,037[57]	30,106,011	12,419,357	46,084,433	6,072,528	7,563,109	1,354,910	15,547,999	1,332,877	31,871,423	14,213,010	49,579	1,655,840	12,606,749	569,210
Southern in Mississippi	281	485,688	754,982	801,962	222,897	71,152	19,469	340,553	33,423	687,494	114,468	.....	56,830	57,638	—110,659
Southern Kansas of Texas	125	845,903	149,006	1,033,076	81,093	205,240	17,661	307,447	29,004	640,445	392,631	.....	16,858	375,773	234,497
Southern Pacific Co.	6,323[58]	38,866,856	21,429,292	64,680,450	6,940,569	8,831,142	1,361,014	17,936,525	1,718,916	36,788,166	27,892,284	1,158,965	2,995,090	26,056,159	2,308,514
Spokane, Portland & Seattle	556[59]	2,208,489	1,126,226	3,634,527	403,784	308,294	60,152	879,030	102,574	1,753,834	1,880,693	1,975	427,200	1,455,468	95,261
Tennessee Central	294	760,134	292,670	1,114,839	232,850	116,721	46,453	385,747	57,495	839,266	275,573	.....	34,118	241,455	80,544
Terminal R. R. Ass'n of St. Louis	34[60]	.....	2,263	2,041,054	309,995	131,772	7,416	759,549	54,479	1,263,211	777,843	86,374	217,645	646,572	158,679
Texas & New Orleans	458	1,836,094	777,135	2,791,845	522,244	640,175	64,525	1,086,821	96,870	2,410,635	381,210	—588	101,892	278,730	26,633
Texas & Pacific	1,885	8,770,433	3,142,987	12,719,661	1,580,407	1,973,438	269,186	5,695,148	370,982	9,889,161	2,830,500	—22,180	440,039	2,368,281	—644,113
Toledo & Ohio Central	443	3,115,510	442,930	3,763,343	533,947	686,296	55,048	1,307,842	73,044	2,656,177	1,107,166	—5,881	171,002	930,283	24,727
Toledo, Peoria & Western	248	570,473	334,264	957,608	165,345	195,360	19,222	346,097	27,860	753,884	203,724	.....	40,600	163,124	25,783
Toledo, St. Louis & Western	451	2,445,810	248,086	2,864,059	363,065	376,774	99,160	997,888	73,033	1,909,920	954,139	.....	118,600	835,539	221,999
Trinity & Brazos Valley	463	1,677,049	402,501	2,160,917	340,694	263,868	82,096	973,197	99,810	1,759,665	401,252	.....	32,513	368,739	72,234
Union Pacific	3,576[61]	25,439,375	7,250,096	35,836,197	3,629,417	4,146,419	700,259	9,488,831	884,845	18,849,771	16,986,426	—24,641	1,454,398	15,507,387	2,139,757
Union R. R. of Baltimore	9	982,929	181,652	1,177,874	75,594	.....	6,906	42,354	21,819	146,673	1,031,201	.....	44,895	986,306	170,630
Union R. R. of Pennsylvania	31	.....	.....	3,069,578	228,793	690,277	916	1,150,046	31,891	2,101,923	967,655	18,128	51,250	934,533	111,321
Vandalia	827	5,343,441	1,643,691	7,749,816	975,157	1,496,295	201,833	2,839,903	149,666	5,662,854	2,086,962	.....	247,902	1,839,060	480,809
Vicksburg, Shreveport & Pacific	171	687,667	361,962	1,146,054	229,367	200,636	26,893	357,987	40,833	855,716	290,338	—3,428	47,634	239,276	22,913
Virginia & Southwestern	240	1,038,511	118,815	1,189,382	182,206	272,643	15,206	328,939	27,735	826,729	362,653	.....	44,332	318,321	—42,840
Virginian	503[62]	3,512,450	208,624	3,821,267	485,737	715,229	42,294	908,167	70,459	2,221,886	1,599,381	47,427	140,700	1,506,108	345,474
Washington Southern	36	301,509	315,955	835,192	105,597	102,002	9,867	328,474	22,902	568,842	266,350	—1,838	27,354	237,158	14,259
West Jersey & Seashore	356	1,250,883	2,872,654	4,404,711	632,883	667,686	117,081	1,778,685	104,122	3,300,457	1,104,254	—32,926	173,515	897,813	288,505
Western Pacific	937	3,155,412	867,524	4,145,489	622,585	349,483	230,809	1,602,995	201,666	3,007,538	1,137,951	—7,158	173,186	957,607	398,713
Western Ry. of Alabama	133	509,335	380,627	964,104	155,853	173,758	46,485	264,458	45,445	685,999	278,105	160	38,499	239,766	4,197
Wheeling & Lake Erie	459[63]	4,732,284	447,783	5,481,344	689,463	1,039,581	64,784	1,752,864	131,214	3,677,906	1,803,438	21,611	243,085	1,581,964	9,725
Yazoo & Mississippi Valley	1,374	5,102,760	1,846,017	7,472,750	1,375,681	1,080,246	121,537	2,938,584	212,266	5,728,314	1,744,436	983	296,000	1,449,419	198,068

Average mileage operated during previous period—[36] 1,230; [37] 3,597; [38] 562; [39] 152; [40] 2,014; [41] 473; [42] 6,034; [43] 404; [44] 1,762; [45] 1,920; [46] 1,760; [47] 4,018; [48] 215; [49] 1,467; [50] 278; [51] 83; [52] 4,732; [53] 510; [54] 3,314; [55] 843; [56] 1,116; [57] 7,089; [58] 6,203; [59] 551; [60] 35; [61] 3,537; [62] 475; [63] 457. — Indicates Deficits, Losses and Decreases.

Railway Officers.

Executive, Financial and Legal Officers.

M. W. Wells, hitherto general superintendent of the Chicago, Terre Haute & Southeastern, has been appointed assistant to the president, with headquarters at Chicago.

J. G. Wilson, who has been assistant interstate commerce attorney of the Harriman Lines at Chicago, has been appointed interstate commerce attorney of the Southern Pacific Lines, with headquarters after May 1 at New York.

Clark B. Ferry, whose election as vice-president and assistant secretary of the Chicago, Milwaukee & St. Paul, with headquarters at New York, has been announced in these columns, was born on May 18, 1859, at Bethel, Conn. From 1868 to 1873 he was a student at the Trinity Institute, Tivoli, N. Y., and in 1875 he graduated from Essex Hall Institute, Orange, N. J. On June 30, of the same year, he began railway work as a clerk with the Chicago, Milwaukee & St. Paul, and has been in the continuous service of that road ever since. In January, 1883, he was elected assistant secretary, and on April 8, was elected also vice-president of the same road, with headquarters at New York, as above noted.

C. B. Ferry.

H. L. Ingersoll, assistant general manager of the New York Central & Hudson River at New York, has been appointed assistant to senior vice-president of the New York Central Lines, with headquarters at New York, and will perform such duties as may be assigned to him by the senior vice-president.

Operating Officers.

J. C. Barton, trainmaster of the Atchison, Topeka & Santa Fe at Pueblo, Colo., has been transferred to Las Vegas, N. M., in a similar capacity, in place of E. Dowling, promoted.

The authority of D. E. Spangler, superintendent of transportation of Norfolk & Western, with headquarters at Roanoke, Va., has been extended over the Williamson & Pond Creek.

Ira L. Burlingame, for the past eight years general superintendent of the Terminal Railroad Association of St. Louis, has been appointed general manager, succeeding to part of the duties of President W. S. McChesney, Jr.

J. H. Rightmeyer, formerly trainmaster of the Illinois Central, at Waterloo, Iowa, has been appointed superintendent and car accountant of the Kentucky & Indiana Terminal Railroad, with headquarters at Louisville, Ky., succeeding T. H. Hayden, resigned, effective April 15.

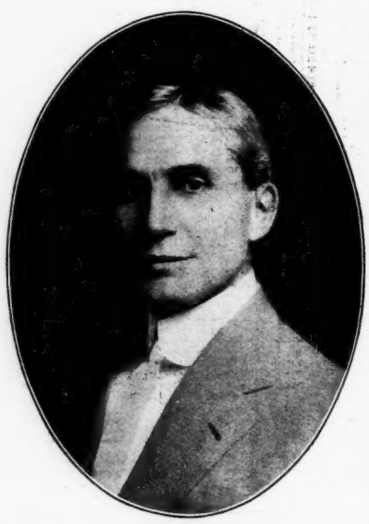
H. E. Jones has been appointed assistant superintendent of the San Antonio & Aransas Pass, having supervision over the lines east and north of Yoakum, Tex., with headquarters at Yoakum. F. T. Bowles, assistant superintendent, with headquarters at Yoakum, will have supervision over the lines west of Yoakum.

D. H. Ryan, chief dispatcher and trainmaster of the Canadian Pacific at Brownville Junction, Me., has been appointed assistant superintendent District 1, Atlantic division, with office at St. John, N. B., succeeding W. B. Brown, transferred, and A. C. Brady, has been appointed assistant superintendent, District 2, Eastern division, with office at Montreal, Que., with special jurisdiction over station staffs and service.

Henry J. Curry, whose appointment as superintendent of the Albany division of the Boston & Albany, with headquarters at Springfield, Mass., has been announced in these columns, was born in March, 1877, at Grand Pre, Nova Scotia, and began railway work in March, 1893, with the Dominion Atlantic Railway as operator and agent. In May, 1896 he left that company to go to the Boston & Albany as an operator, and ever since has been in the continuous service of that road. In November, 1901, he was made train despatcher, and in August, 1907, became chief train despatcher at Boston, Mass. He was promoted to trainmaster with headquarters at Beacon Park, Allston, Mass., in March, 1910, which position he held at the time of his recent appointment as superintendent of the same road as above noted.

Arthur Bointon Shafer, whose appointment as assistant superintendent of the New York, Susquehanna & Western, and the Wilkesbarre & Eastern, with headquarters at Jersey City, N. J., has been announced in these columns, was born on April 19, 1871, at Milford, N. J., and was educated at the high school of his native town. He began railway work as an operator on the Lehigh Valley in August, 1888, and from January, 1890, to September, 1891, was operator on the Belvidere division of the Pennsylvania Railroad. He was then for about one year agent of the Lehigh & Hudson. From October, 1892, to October, 1894, he was operator and agent on different roads, and then went to the New York, Susquehanna & Western, and the following year was appointed train despatcher, becoming chief train despatcher in September, 1904. He was later trainmaster on the Wilkesbarre & Eastern, and now becomes assistant superintendent of the New York, Susquehanna & Western, and the Wilkesbarre & Eastern as above noted.

Willis E. Morse, who has been appointed general manager of the Denver, Northwestern & Pacific, with headquarters at Denver, Colo., was born September 27, 1864, at Belvidere, Ill. He received a high school education and attended Wayland University one year. He began railway work in December, 1881, as a telegraph operator for the Chicago & North Western, and the following two years he filled various positions in the station service. From 1884 to 1889, he was train despatcher, and in the latter year was promoted to trainmaster, which position he held for four years. He was then made assistant superintendent, and from 1897 to January, 1906, was superintendent of various districts. On the latter date Mr. Morse was appointed general superintendent of the lines east of the Missouri river, and on November 1, 1910, he became assistant general manager, with headquarters at Chicago, resigning in March, 1912, on account of ill health. In a recent item regarding Mr. Morse's new position his name was incorrectly given as William E. Morris.



W. E. Morse.

Traffic Officers.

T. B. McGill has been appointed contracting freight agent of the Union Pacific, with headquarters at Chicago.

Martin L. Schultz has been appointed commercial agent of the Missouri & North Arkansas, with headquarters at Chicago.

L. J. McFaul has been appointed district freight and passenger agent of the Southern Pacific, with headquarters at Salt Lake City, Utah.

George B. Hugel has been appointed soliciting freight agent of the Denver & Rio Grande and the Western Pacific, with headquarters at Chicago.

A. Engelhardt has been appointed traveling freight agent of the Delaware & Hudson Company, with office at Pittsburgh, Pa., succeeding Gordon Edwards, resigned.

F. H. Erhart has been appointed traveling freight agent of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Kansas City, Mo., in place of H. W. Rogers, deceased.

R. H. Crozier has been appointed assistant general passenger agent of the Spokane, Portland & Seattle, Oregon Electric, Oregon Trunk and United Railways, with headquarters at Portland, Ore.

C. M. Agnew, traveling freight agent of the Southern, with headquarters at Kansas City, Mo., has been transferred to Omaha, Neb., as commercial agent in place of J. R. L. Wulff, promoted.

W. J. Berger, city passenger agent of the Chicago, Burlington & Quincy, at New York, has been appointed general agent of the passenger department, with headquarters at New York, succeeding to the duties of W. J. O'Meara, deceased, who was eastern passenger agent.

C. J. Jones, who, on April first, became general freight agent of the Southern Pacific, with headquarters at San Francisco, Cal., began railway work in 1880 with the Burlington, Cedar Rapids & Northern at Muscatine, Iowa, as a telegraph operator and clerk in the local freight office, after completing a high school course. He went to the Arizona & New Mexico in 1883 as trainmaster and agent at Lordsburg, N. M., and entered the service of the Southern Pacific in 1887. He was employed by that company as local agent and trainmaster at various places until 1901, when he was appointed district freight and passenger agent at Sacramento, Cal. Two years later he was made freight agent at the San Francisco local station, and in 1904 he was promoted to assistant general freight agent. He left the Southern Pacific in 1910 to accept the position of traffic manager of the Alaska Steamship Company and the Copper River & Northwestern, with headquarters at Seattle, Wash., and now returns to the Southern Pacific as general freight agent, as above noted.

C. J. Jones.

Engineering and Rolling Stock Officers.

W. R. Roof has been appointed engineer of bridges and buildings of the Chicago Great Western, with headquarters at Chicago, succeeding C. Chandler.

The headquarters of W. L. Kellogg, superintendent of motive power of the Missouri, Kansas & Texas, have been transferred from Parsons, Kan., to Denison, Tex., effective April 8.

A. P. Walker, assistant division engineer, Ontario division, of the Canadian Pacific, at Toronto, Ont., has been appointed division surveyor, Ontario division, with office at Toronto.

N. E. Brooks, division engineer of the Canadian Pacific, at Calgary, Alta., has been appointed engineer maintenance of way, Western lines, with headquarters at Winnipeg, Man., in place of R. C. St. John.

Edward A. Park has been appointed superintendent of motive power and equipment of the Peoria & Pekin Union, with headquarters at Peoria, Ill. The position of master mechanic, held by J. W. Hill, is abolished.

J. R. Greiner, general foreman of the Cincinnati, Hamilton & Dayton, at Lima, Ohio, has been appointed master mechanic of the San Pedro, Los Angeles & Salt Lake, with headquarters at Milford, Utah, succeeding T. M. Vickers, resigned.

L. F. Lonnbladh, formerly superintendent and chief engineer of the Tennessee Central, has been appointed engineer maintenance of way of the Missouri, Kansas & Texas, with headquarters at Parsons, Kan., to succeed F. Ringer, promoted; effective April 10.

A. M. Lupfer, chief engineer of the Spokane, Portland & Seattle, the Oregon Trunk and the Spokane & Inland Empire, will also have jurisdiction over the Oregon Electric and the United Railways, with headquarters at Portland, Ore., succeeding L. B. Wickersham, who has been appointed chief electrical engineer of the two latter roads, with office at Portland, Ore.

R. A. Rutledge, assistant chief engineer of the Gulf, Colorado & Santa Fe, at Galveston, Tex., has been appointed chief engineer, Eastern lines of the Atchison, Topeka & Santa Fe, with office at Topeka, Kan., succeeding C. F. W. Felt, promoted, and F. M. Bisbee, principal assistant engineer at La Junta, has been appointed chief engineer Western lines, with office at Amarillo, Tex.

C. Chandler, engineer of bridges and buildings of the Chicago Great Western, has been appointed assistant bridge engineer of the Illinois Central, with headquarters at Chicago, succeeding M. Johnson, promoted, effective April 15. Mr. Chandler was born September 30, 1875, at Bushnell, Ill., and attended Swarthmore College, 1892-1896. He began railway work July 15, 1897, as draftsman in the bridge and building department of the Illinois Central. In 1902 he was made chief draftsman of that road, which position he held until December 1, 1910, when he resigned to become engineer of bridges and buildings of the Chicago Great Western. He now returns to the Illinois Central as assistant bridge engineer, as above noted.

William Frederick Steffens, whose appointment as assistant chief engineer of the Chesapeake & Ohio, the Chesapeake & Ohio of Indiana and the Hocking Valley, with headquarters at Richmond, Va., has been announced in these columns, graduated as a civil engineer from the Massachusetts Institute of Technology in 1898. The same year he entered the service of the New York, New Haven & Hartford as structural draftsman, and left that company in 1901 to go with the Erie as transitman. From November, 1901, to November, 1905, he was with the New York Central & Hudson River, first as draftsman and structural designer, and subsequently as assistant engineer. He was then for about four years engineer of bridges and buildings on the Carolina, Clinchfield & Ohio. In December, 1909, he was appointed engineer of structures of the Boston & Albany, which position he held at the time of his recent appointment as assistant chief engineer, as above noted.

Daniel Joseph Brumley, whose appointment as engineer maintenance of way of the Illinois Central and the Yazoo & Mississippi Valley, with headquarters at Chicago, has already been announced in these columns, was born March 19, 1865, near Belmore, Ohio. He was graduated in civil engineering from the Ohio State University in 1895, and began railway work in June of that year as assistant section foreman on the Louisville & Nashville at Evansville, Ind. From August to December, 1896, he was with the Columbus & Hocking Coal & Iron Company as assistant engineer at New Straitsville, Ohio, and during the two succeeding years he was successively assistant supervisor of the Louisville & Nashville, at Belleville, Ill., section foreman at Evansville, rodman at Louisville, Ky., and assistant engineer at Clarksville, Tenn. He was then on December 3, 1898, transferred to the chief engineer's office at Louisville as assistant engineer, and in April of the following year was made assistant engineer of that road, with headquarters at Louisville. He left the Louisville & Nashville in September, 1901, to go to the Mexican National as roadmaster at Laredo, Tex., but returned to the former road one month later as roadmaster at Elizabethtown, Ky., where he remained until October, 1904. On the latter date he was appointed division engineer of the Indianapolis Southern at Indianapolis, Ind., and in March, 1905, was made principal assistant engineer of the Illinois Central, the Yazoo & Mississippi Valley and the Indianapolis Southern, with headquarters at Chicago. In June, 1910, he became engineer of construction of the two former roads, which position he held until his recent promotion on April 1 to engineer of construction, as above noted.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Grand Trunk has ordered 50 mikado locomotives from the Montreal Locomotive Works.

The Florida East Coast is said to have ordered 24 Pacific type locomotives from the American Locomotive Company. This item has not been confirmed.

The Peking-Kalgan Railway, China, has ordered 4 Mallet locomotives (2-8-8-2) from the American Locomotive Company. The dimensions of the cylinders will be 18½ in. and 29 in. x 22 in., the diameter of the driving wheels will be 42 in., and the total weight in working order will be 300,000 lbs.

The Buffalo, Rochester & Pittsburgh, as mentioned in the *Railway Age Gazette* of March 28, has ordered 12 mikado locomotives and 3 Pacific type locomotives from the American Locomotive Company. The specifications and special equipment for these locomotives are as follows:

	Pacific.	Mikado.
Simple or compound	Simple	Simple
Weight on drivers	165,000 lbs.	218,000 lbs.
Total weight	262,000 lbs.	277,000 lbs.
Diameter of cylinders	24½ in.	26½ in.
Stroke of pistons	26 in.	30 in.
Diameter of drivers	73 in.	63 in.
Type of boiler	Extended wagon top	Extended wagon top
Working steam pressure	200 lbs.	180 lbs.
Heating surface, tubes	3,391 sq. ft.	3,391 sq. ft.
Heating surface, arch tubes	30 sq. ft.	30 sq. ft.
Heating surface, firebox	204 sq. ft.	204 sq. ft.
Heating surface, total	3,625 sq. ft.	3,625 sq. ft.
Tubes, number	240 / 32	240 / 32
Tubes, outside diameter	2 in. / 5⅜ in.	2 in. / 5⅜ in.
Tubes, length	20 ft. 0 in.	20 ft. 0 in.
Firebox, type	Radial stayed	Radial stayed
Firebox, length	108 in.	108 in.
Firebox, width	75¼ in.	75¼ in.
Firebox, material	Open hearth steel	Open hearth steel
Grate area	56½ sq. ft.	56½ sq. ft.
Tank capacity for water	9,000 gals.	9,000 gals.
Coal capacity	15 tons	15 tons

SPECIAL EQUIPMENT.

Axles	Open hearth steel
Bell ringer	Hammett
Boiler lagging	Franklin sectional magnesia
Brakes	Westinghouse—American
Brake beams	Waycott
Brick arch	American Arch Co.
Couplers	Sharon
Driving boxes	Lawrenceville Bronze Co.
Headlight	Pyle electric on the Pacifics
Headlight	Dressel on the mikados
Injector	Nathan Monitor
Piston and valve rod packings	"King"—U. S. Metallic
Safety valve	Consolidated
Sanding devices	Leach
Sight-feed lubricators	Nathan
Steam gages	Ashcroft
Steam heat equipment	Safety Co. on the Pacifics
Superheater	Schmidt
Tires	Midvale
Valve gear	Walschaert
Wheel centers	Cast steel

CAR BUILDING.

The Grand Trunk has ordered 2,000 box cars from the Pressed Steel Car Company, and 1,000 box cars from the Western Steel Car & Foundry Company.

IRON AND STEEL.

The Pennsylvania Lines West have ordered 1,400 tons of bridge material for replacements.

General Conditions in Steel.—Consumers are holding off in expectation of lower prices following the tariff revision. Orders have consequently been light, but specifications continue heavy. The damage to the industries by the flood is being rapidly repaired, and full resumption of activity in the flooded district is expected within a week. A considerable volume of tonnage will be necessary to replace the bridges destroyed by the flood. In most cases the old structures are being replaced with better ones.

Supply Trade News.

The Gould Coupler Company has moved its New York offices from 341-347 Fifth avenue, to 30 East Forty-second street.

Hiram J. Slifer, a consulting civil engineer, specializing in steam railway practice, has moved his office to the Rookery, Chicago.

The Western Railway & Mill Supply Company, San Francisco, Cal., which makes and sells railway supplies, has changed its name to the Edward S. Sullivan Company.

The two Chicago plants of the Allis-Chalmers Company were bid in for $1,000,000 by the purchasing committee of the reorganized company at a judicial sale held in Chicago on April 8.

The Horace L. Winslow Co., contractors and heating experts, have recently found it necessary, on account of expansion resulting from increase of business, to move into new and larger offices at 990 Old Colony building, Chicago.

The Yale & Towne Manufacturing Company, New York, has moved its general offices from 9 Murray street, to 9 East Fortieth street, New York. The new building, built and owned by the company, is twelve stories high and occupies a plot 50 ft. by 100 ft. The entire ground floor will be devoted to exhibit rooms.

Charles Robbins, manager of the industrial and power department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., with office in Pittsburgh, has been made assistant sales manager, with office at East Pittsburgh. J. M. Curtin, assistant manager of the industrial and power department has been made manager of that department, succeeding Mr. Robbins.

During the week of April 7 the heads of departments and managers of various offices of Robert W. Hunt & Co. met with the firm at the general office in Chicago in annual conference. Papers on the various methods of conducting the work of inspection and testing were discussed, and on Thursday and Friday a party was taken on inspection trips to Gary, South Chicago and Buffington.

The Dearborn Chemical Company, Chicago, is building a reinforced concrete manufacturing plant at Toronto, Ont., at a cost of about $100,000. This plant, which will be completed during the coming summer, will have railroad connection with both the Canadian Pacific and the Grand Trunk. A. W. Crouch will have charge as vice-president and general manager, with office in Toronto. Mr. Crouch has for the past eight years been district manager of the company, with office in Pittsburgh, Pa.

The Kennicott Company, Chicago Heights, Ill., has been awarded the John Scott legacy medal for its water weigher or measuring device. The medal was awarded by the city of Philadelphia upon recommendation of the Franklin Institute for promotion of the mechanic arts. The award was made after a thorough investigation "in consideration of its novelty, its simplicity of design, and its accuracy as a water measuring device." The principle of the operation of the weigher is described in bulletin No. 38, issued by the company.

TRADE PUBLICATIONS.

Dump Cars.—The Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio, has published an attractive folder entitled Some Snap Shots, illustrating the operation of its automatic, air, dump cars. The booklet also tells how rapidly and simply these operations are accomplished.

Steel Sash.—The David Lupton's Sons Company, Philadelphia, Pa., has devoted catalog No. 7 to detailed descriptions and illustrations of its products, including steel sash for side walls, steel partitions and doors, Pond continuous sash, Pond operating device, rolled steel skylight, hollow metal windows, etc.

Concrete Posts.—The National Reinforced Concrete Corporation, of San Francisco, has issued an illustrated folder devoted to its reinforced concrete hollow and solid poles and posts for electric lighting, fencing, telegraph, telephone and trolley wires. The pamphlet includes illustrations and descriptions of various installations of these posts.

Railway Construction.

Abilene & Southern.—Plans are being made to build an extension, it is said, from Hamlin, Tex., northwest to Matador, through the counties of Stonewall, Dickens and Motley, about 100 miles. Later it is planned to further extend the line from Matador to a point on the Forth Worth & Denver City, probably at either Clarendon or Claude. Col. Morgan Jones is in charge of the preliminary work of this prospective extension. Large bonuses in aid of the project are being raised in the towns and rural communities along the route.

Birmingham-Tuscaloosa Railway & Utilities Company (Electric).—An officer writes that the plans call for building from Birmingham, Ala., southwest via Bessemer to Tuscaloosa, 54 miles. Contract for the work has been given to the Tidewater Construction Company, Birmingham. As soon as the location is made, grading work will be started. It is to be a high speed electric line for freight and passenger service. The Tuscaloosa Belt Railway, operating 14 miles of track in Tuscaloosa is now being reconstructed, the work includes filling in the old trestles and reducing the grades and curves. It is to form part of the through line. C. R. Carter, C. S. Gannon and W. S. Adams, are incorporators. (March 28, p. 779.)

Brule Lake.—Incorporated in Alberta, Canada, to build from the Grand Trunk Pacific east of Brule Lake, at mileage 994, southeasterly to township 49, range 26, west of the 5th meridian. The provisional directors include G. G. S. Lindsay, Toronto, Ont.; S. R. Woods, O. M. Biggar, S. W. Field and J. T. J. Collison, Edmonton, Alta.

Campbellford, Lake Ontario & Western.—See Canadian Pacific.

Canadian Northern.—Application has been made by this company for permission to build a branch from mileage 111.89 on the Oak Point branch, in Manitoba, through sections 29, 32 and 33, township 26, and sections 16, 15 and 22, township 27, range 7, west principal meridian.

Canadian Pacific.—The Canadian parliament has extended the time for building the Campbellford, Lake Ontario & Western. The route is south from Glen Tay, Ont., to the Lake Ontario shore, thence west parallel to the Grand Trunk on the north side via Port Hope to Agincourt. The entire line is under contract, and track laying will be started this month.

Chesapeake & Ohio.—An officer writes that a contract has been given to the C. D. Langhorne Construction Company, Beaver, Ky., to build the Elkhorn & Beaver Valley from Beaver Creek station on the C. & O.'s Big Sandy district to the mouth of Steels' Creek, through Floyd county, Ky., 21 miles. (April 11, p. 863).

Chicago, Milwaukee & St. Paul.—An officer writes that the line which has been under construction for about a year from Plummer, Idaho, to Bell, Wash., about 20 miles, is expected to be finished this season. H. C. Henry is the contractor.

The Priest Rapids line of the Puget Sound Lines, extending southeast from Beverly Junction, Wash., has been opened for freight traffic to Hanford.

Cumberland & Shippensburg (Electric).—An officer writes that a contract will be let in the near future to build from Chambersburg, Pa., northeast to Shippensburg. There will be two steel bridges on the line. P. M. Mahon is president, Chambersburg.

Delaware & Hudson.—See Watervliet, N. Y., under Railway Structures.

Gulf, Florida & Alabama.—An officer writes that work on the twenty-mile extension on the northerly end, for which a contract was recently let to J. P. McCarthy & Company, of Gainesville, is expected to be completed and the section open for operation by August. On the completion of that work, the company expects to build a fifty-mile extension to a connection with the Mobile & Birmingham branch of the Southern at Pine Hill. On the latter section there will be some fairly heavy steam shovel work, involving the handling of about 1,250,000 cu. yds. There will also be a bridge at a point five miles from Pine Hill over the Alabama river, involving some heavy sub-structural work. (March 7, p. 759.)

Lewiston-Clarkston Valley (Electric).—An officer writes that the plans call for building from a point in Idaho west via Lewiston to Clarkston, Wash., and then south to Asotin, about 12 miles. In addition there will be an 8-mile branch southeast from Lewiston to Lewiston Orchards. Track has been laid on 6,000 ft. F. L. Sturm, president, and P. T. Oehler, chief engineer, Lewiston.

Montezuma San Juan Southern.—We are told that this company will ask for incorporation soon to build about 200 miles of railroad from a point near Dolores, Colo., south via Cortez and Mancos, and along the La Plata river via Fruitland, N. Mex., thence across the Indian Reservation to a point at or near Grants, N. Mex., where a connection is to be made with the Santa Fe line. The route is through a flat country, with the exception of a 20-mile section over the continental divide. The company expects to develop a traffic in coal, live stock, potatoes, fruit and lumber. Emil Stein, Durango, Colo., and W. A. Venter, New York, are interested. Roy F. Goodman is chief engineer.

Norfolk & Western.—The extension of the Dry Fork branch, from Canebrake, W. Va., to a connection with the Clinch Valley district, at Cedar Bluff, Va., 15.84 miles, was opened for operation on April 15.

Palatka-Hastings Interurban.—A franchies has been given to this company, it is said, to build a 10-mile line from Palatka, Fla., northeast to Hastings. C. A. DuPont, president, Palatka.

Pigeon Valley.—Incorporated in Wisconsin, with headquarters at Pigeon Falls, Trempealeau county, to build from that place to Hay creek, in the town of Bridge Creek, Eau Clair county, 20 miles.

Portage Radial Railway & Canal.—Incorporated in Manitoba, Canada, to build from Portage la Prairie to Winnipeg, and from Portage la Prairie to Delta, with branch lines; also a canal from Lake Manitoba through Portage la Prairie to the Assiniboine river. The provisional directors include: W. Richardson, H. Stephens, F. G. Taylor, Portage la Prairie; B. L. Grant, St. Francois Xavier; A. H. Oakes, Winnipeg, Man.

Riviera Beach & Western.—An officer writes that construction work is about finished on this line from Riviera, Tex., east through a farming district, to Riviera beach on the Gulf coast, 9.7 miles. At Riviera a connection is made with the St. Louis, Brownsville & Mexico. Steam is used as the motive power for freight traffic, and gasolene motor cars for passenger traffic. T. F. Koch, president, Houston, and M. W. Jones, general manager, Riviera.

Salem, Falls City & Western.—A bridge over the Willamette river at West Salem, Ore., has been completed and put into service, thereby connecting up the line recently completed from Dallas to Salem, Ore.

Seaboard Air Line.—The extension from Mulberry, Fla., east to Bartow is open for business, and through trains are now in operation between Bartow and Tampa.

Shenandoah Valley (Electric).—Final surveys are being made, it is said, in Berkeley and Jefferson counties, West Virginia, and in Frederick and Clark counties, Virginia, for an electric line to be built this spring. Surveys at Martinsburg and near that place have been completed. C. W. Watson, of Fairmont, is back of the project.

Taber Transit.—Incorporated in Alberta, Canada, to build from section 31-9-16 west of the 4th meridian, northwesterly to section 12-10-7, with branches to section 33-9-17 and section 7-10-7; and a second line also from section 31-9-16 north and northeasterly to Bow City, Alta. The provisional directors include: J. F. Kramer, V. O. Eastland, Calgary, Alta.; C. D. Holder, Dunmore; J. Schissil, Canmore; W. E. Bullock, F. Barton, Taber, and E. S. Kramer, Philadelphia, Pa.

Tuscaloosa Belt.—See Birmingham-Tuscaloosa Railway & Utilities Company.

Wetaskiwin, Yellowhead & Pacific.—Incorporated in Canada to build from Wetaskiwin, Alta., west along the Saskatchewan and the Brazeau rivers to the Yellowhead Pass, thence south to Revelstoke, B. C., about 500 miles. The names of the incorporators are not given.

Willapa Bay & Eastern.—Incorporated in the state of Washington with $2,000,000 capital, and headquarters at Seattle, to to build from Lincoln Creek, in Lewis county, Wash., west to a point near South Bend, thence along the North river to the O-W. R. & N., at South Bend. The incorporators include W. H. Bogle, F. T. Merritt and C. P. Bissitt.

RAILWAY STRUCTURES.

Charlestown, W. Va.—An officer of the Norfolk & Western writes regarding the report that a station is to be built at Charlestown, that the company has bought land as a site, but has not yet decided when the station will be built.

Chicago, Ill.—The Baltimore & Ohio has let a contract to James Stewart & Company, New York and Chicago, for the construction of a grain elevator in the Calumet river district at South Chicago, to have a capacity of 875,000 bushels. The elevator will have a steel frame and be fireproof throughout, and will be erected on concrete foundations. The work house will contain 55 bins, with a capacity of 250,000 bushels, and there will be 70 storage bins with a capacity of 625,000 bushels. There will be three receiving elevators in the building, three shipping elevators, two cleaning elevators and a screening elevator. It is planned to begin work at once in order that it may be completed in time to receive this year's crop.

The Chicago & Alton has let a contract to George B. Swift & Co. for a 30-stall roundhouse, a coal tepple and ash pit at Glenn Yards, Chicago.

Del Rio, Tex.—Plans have been prepared for a new 18-stall roundhouse and repair shop.

Green Bay, Wis.—The Chicago & North Western will build a new 40-stall engine house, brick power house, store and oil houses, mechanical coal chute, water tank, ice house, and other buildings in connection with track changes and other improvements, to cost approximately $350,000 in all.

Muskegon, Mich.—The Pere Marquette is planning to build a new two-story freight house.

Pine Hill, Ala.—See Gulf, Florida & Alabama under Railway Construction.

Watervliet, N. Y.—The report of the Delaware & Hudson Company for the year ended December 31, 1912, shows that during the year a program was inaugurated covering extensive bridge renewals and betterments to make all bridges capable of carrying heavy engines. Part of the work was completed in 1912, and will be continued throughout the years 1913 and 1914. During the year there were completed and put in operation the shops and terminals at Watervliet; cold storage plant at Glenville; roundhouse and coaling facilities at Carbondale, Pa.; grade reduction and change of line Oneonta, N. Y., to Nineveh; one mile of double track north of Binghamton, N. Y., and a large number of spur tracks and sidings. New passenger stations were built at Lake George, N. Y., and at Dennemora, and the freight house facilities at the latter place were improved. Work is now under way on an under-crossing, including solid floor three track through girder bridge, 78 ft. long, at Slingerlands, N. Y.; a concrete over-head bridge, concrete cattle pass and approaches, at Bainbridge, N. Y., and an over-crossing at Robinson street, Binghamton. Substantial improvements in the station and yard layout at Sidney, N. Y., have been started. The improved facilities at this place will be used jointly by the D. & H. Co. and the New York, Ontario & Western. The freight house at Green Island is now being enlarged and additional tracks constructed.

Wichita, Kan.—The Atchison, Topeka & Santa Fe is planning to begin work shortly on a 12-stall roundhouse and shops.

Better Roads in Argentina.—A considerable amount of work has been carried out by the Argentine road commission during the latter half of the calender year of 1912 improving the access to the stations within the district reached by the Buenos Ayres Great Southern. This has proved of great benefit in connection with the cartage of the crops.

Railway Financial News

Baltimore & Ohio.—The syndicate which underwrote the $62,250,000 convertible 4½ per cent. bonds which were offered to stockholders at 95½ has been dissolved and members are at liberty to dispose of their bonds.

Chicago, Milwaukee & St. Paul.—The $30,000,000 4½ per cent. bonds which were sold by the railway company to Kuhn, Loeb & Co. and the National City Bank, both of New York, as mentioned in these columns last week, is being offered to the public by the bankers at 99½. These bonds are secured by a direct mortgage on 6,315 miles of first track and on terminal properties in Chicago, Milwaukee and other cities and on the entire equipment of the company. The general mortgage bonds are secured by an absolute first mortgage on 3,753 miles of road, including the main lines entering Chicago and Milwaukee.

The total general mortgage bonds outstanding, including prior liens, are at the average rate of $22,193 per mile on the 6,315 miles of road on which they are secured. Of the total authorized issue of $150,000,000 general mortgage bonds, there are outstanding $8,950,000 3½ per cent. bonds; $48,841,000, 4 per cent. bonds; $9,852,000 bonds in the treasury; $52,357,000 bonds reserved to retire prior liens and the $30,000,000 now being offered. The bonds are a legal investment for savings banks in New York, Massachusetts and Connecticut.

Delaware & Hudson.—See editorial comment on this company's annual report.

Denver & Salt Lake.—C. E. Mitchell & Co., New York, are offering $488,000 Equipment Trust 5 per cent. notes, dated March 1, 1913, at prices for different maturities to yield about 5⅝ per cent. on the investment. The Denver & Salt Lake is the successor company to the Denver, Northwestern & Pacific. Title to the equipment purchased under these notes remains with the trustee of the notes.

Detroit Southern.—The Protective Committee representing the Ohio & Southern division first mortgage bonds, has adopted a plan of reorganization subject to the lien of this mortgage, and it is understood that more than 92 per cent. of the bonds outstanding under this mortgage have been deposited with the committee.

Under the general plan of reorganization provision is made for raising the sum of $2,247,500 of new money to provide funds for payment of receivers' certificates and indebtedness of the receiver chargeable against the Ohio Southern division, cost of contemplated betterments to the railroad and its equipment, working capital, etc. This amount shall be raised by requiring the holders of the present $4,495,000 of outstanding Ohio Southern division mortgage bonds to purchase the following amounts of securities of the new company: Adjustment mortgage, 5 per cent. 40-year gold bonds, $2,247,500; preferred stock $4,495,000, and common stock $2,247,500. Each holder of an Ohio Southern division mortgage bond, par value $1,000, will thus be required to pay $500 in cash and receive therefor $500 in new adjustment mortgage bonds, $1,000 in new preferred stock and $500 in new common stock.

It is proposed that the new company shall authorize the following securities: (1) $1,500,000 first mortgage 5 per cent. 40-year gold bonds, dated July 1, 1913. (2) $2,250,000 adjustment mortgage 5 per cent. 40-year gold bonds, dated July 1, 1913, on which the interest is cumulative, with the provision that there is to be no right of foreclosure for non-payment of interest until maturity of the principle. (3) $4,500,000, par value preferred stock, entitled to non-cumulative dividends of 4 per cent. per annum. (4) $4,500,000 par value common stock.

Grand Trunk Pacific.—Stockholders have authorized a further issue of $25,000,000 debenture stock.

Howard G. Kelly has been elected a director, succeeding F. H. Fitzhugh, resigned.

Houston & Texas Central.—The Texas legislature has authorized this company to consolidate with it the Hearn & Brazos Valley, which runs from Hearn to Stone City, Texas, 19 miles.

Hearn & Brazos Valley.—See Houston & Texas Central.

Long Island Railroad.—A. J. County, assistant to the president of the Pennsylvania, and Percival Roberts, Jr., have been elected directors, succeeding James McCrea and Charles E. Pugh, both deceased.

Minneapolis, St. Paul & Sault Ste. Marie.—The Michigan Railroad Commission has authorized this company to issue $2,703,000 consolidated mortgage, 4 per cent. bonds to pay for 135 miles of new road which has recently been built.

Missouri, Kansas & Texas.—H. E. Andrews, president of the New York State Railways, and F. H. Davis, of Hawley & Davis, New York, have been elected directors, succeeding A. A. Allen, until recently president, and A. W. Smithers, resigned.

See comments made by the Houston *Chronicle* on the merger bill passed by the Texas legislature reprinted in general news.

New York Central & Hudson River.—This company has sold in London £2,000,000 ($10,000,000), one-year, 5 per cent. notes on a basis, according to the *Commercial and Financial Chronicle*, of 5⅜ per cent.

Oklahoma Central.—The sale of this road, which is in the hands of the receiver, has been ordered by the United States District Court for October 9.

St. Louis Southwestern.—The Texas legislature has authorized the consolidation of the Stephenville, North & South Texas with the St. Louis Southwestern.

See comments of the Houston *Chronicle* printed elsewhere.

Southern Pacific.—This company has asked authority of the California Railroad Commission to issue $10,120,000 4½ per cent. Equipment Trust certificates.

Charles W. Harkness and L. E. Loree, president of the Delaware & Hudson, have been elected directors, succeeding C. H. Kelsey and George B. Leighton.

Texas & Pacific.—See an item in regard to merger bill passed by the Texas legislature, reprinted in another column from the Houston *Chronicle*.

ANNUAL REPORT

THE DELAWARE AND HUDSON COMPANY—EIGHTY-THIRD ANNUAL REPORT.

GENERAL OFFICE.

New York, N. Y., March 31, 1913.

To the Stockholders of
The Delaware and Hudson Company:

The President and the Board of Managers submit the following statements of the affairs of the Company for the year ended December 31, 1912:

The results from operation of the Coal Mining Department were:

Year.	Coal Mined.	†Revenues.	‡Expenses.	Net Revenue.
1912	6,438,555 tons.	$13,397,557.48	$12,811,520.34	$586,037.14
1911	7,280,939 "	13,355,014.38	13,238,304.12	116,710.26
Increase	*842,384 tons.	$42,543.10	*$426,783.78	$469,326.88

†Excluding dividends received from stock of Coal Companies owned.
‡Excluding taxes.
*Decrease.

The results from operation of the Railroad Department were:

Year.	Miles Operated.	Operating Revenues.	‡Operating Expenses.	Net Operating Revenues.	Percentage of Expenses to Revenues.
1912	877.60	$22,480,102.95	$14,066,778.74	$8,413,324.21	62.57
1911	877.60	21,421,816.83	12,758,159.48	8,663,657.35	59.56
Increase		$1,058,286.12	$1,308,619.26	*$250,333.14	3.01

‡Excluding taxes.
*Decrease.

RAILROAD DEPARTMENT.

Revenues and Expenses.

The general distribution of the Operating Revenues and of the Operating Expenses of the Railroad Department was as follows:

Revenues:	1912.	1911.	Increase or Decrease.
From Coal Freight Traffic	$10,346,094.92	$9,847,193.63	$498,901.29
" Merchandise Freight traffic (including switching)	8,476,850.69	8,053,787.79	423,062.90
" Passenger Traffic	3,076,507.07	3,019,229.53	57,277.54
" Express Traffic	305,119.40	235,338.64	69,780.76
" Transportation of Mails.	119,445.51	119,349.88	95.63
" Miscellaneous Sources	156,085.36	146,917.36	9,168.00
Total Operating Revenues	$22,480,102.95	$21,421,816.83	$1,058,286.12
Expenses:			
For Maintenance of Way and Structures	$1,940,352.37	$1,488,756.81	$451,595.56
" Maintenance of Equipm't	3,230,742.16	3,060,739.03	170,003.13
" Traffic Expenses	289,754.01	250,285,23	39,468.78
" Transportation Expenses.	7,979,041.22	7,414,071.40	564,969.82
" General Expenses	626,888.98	544,307.01	82,581.97
Total Operating Expenses	$14,066,778.74	$12,758,159.48	$1,308,619.26
Net Revenue from Operation	$8,413,324.21	$8,663,657.35	—$250,333.14
Percentage of Expenses to Revenues	62.57	59.56	3.01

GENERAL INCOME ACCOUNT OF THE DELAWARE AND HUDSON COMPANY, YEAR ENDED DECEMBER 31, 1912, IN COMPARISON WITH YEAR ENDED DECEMBER 31, 1911.

	1912.	1911.	Increase or Decrease.
COAL MINING DEPARTMENT:			
Gross Revenues	$13,397,557.48	$13,355,014.38	$42,543.10
Gross Expenses	12,811,520.34	13,238,304.12	—426,783.78
Net Revenues	$586,037.14	$116,710.26	$469,326.88
Taxes Accrued	355,092.68	141,011.00	214,081.68
Operating Income	$230,944.46	Loss$24,300.74	$255,245.20
Other Income:			
Dividends and Interest	792,923.61	308,519.84	484,403.77
Gross Income Coal Department	$1,023,868.07	$284,219.10	$739,648.97
RAILROAD DEPARTMENT:			
Gross Operating Revenues	$22,480,102.95	$21,421,816.83	$1,058,286.12
Gross Operating Expenses	14,066,778.74	12,758,159.48	1,308,619.26
Net Operating Revenues	$8,413,324.21	$8,663,657.35	—$250,333.14
Taxes Accrued	600,944.31	562,409.66	38,534.65
Operating Income	$7,812,379.90	$8,101,247.69	—$288,867.79
Other Income:			
Hire of Equipment	$99,596.29	$150,503.27	—$50,906.98
Outside Operations	Loss 20,733.16	Loss 12,435.79	Loss 8,297.37
Dividends and Interest	1,154,195.93	1,167,020.41	—12,824.48
Miscellaneous Items	36,359.60	69,908.94	—33,549.34
Total Other Income	$1,269,418.66	$1,374,996.83	—$105,578.17
Gross Income Railroad Department	$9,081,798.56	$9,476,244.52	—$394,445.96
Deductions from Income:			
Rentals	$2,034,256.69	$2,022,925.80	$11,330.89
Interest on 1st and Refunding Mortgage Bonds (1943)	1,108,160.00	1,087,159.98	21,000.02
Interest on 1st Mtge. Bonds (1917)	350,000.00	350,000.00	.....
Interest on Debenture Bonds (1916)	558,920.01	558,926.22	—6.21
Interest on 1st Lien Equipment Bonds (1922)	436,288.26	436,454.88	—166.62
Interest on Debenture Bonds (1914)	12,000.00	20,000.00	—8,000.00
Interest on Divisional Bonds	75,000.00	75,000.00	.....
General Interest and Discount.	95,310.15	35,199.70	60,110.45
Total Deductions	$4,669,935.11	$4,585,666.58	$84,268.53
Net Income Railroad Department	$4,411,863.45	$4,890,577.94	—$478,714.49
GENERAL:			
Miscellaneous Income:			
Dividends and Interest on Securities Owned	$11,276.00	$11,296.00	—$20.00
Rentals, Real Estate	42,310.97	21,069.98	21,240.99
General Interest and Discount.	25,469.23	39,280.44	—13,811.21
Total Income	$79,056.20	$71,646.42	$7,409.78
Taxes Accrued	8,698.30	8,762.59	—64.29
Net Income General	$70,357.90	$62,883.83	$7,474.07
Net Income Carried to General Profit and Loss	$5,506,089.42	$5,237,680.87	$268,408.55
Percentage to Capital Stock	12.95% on $42,503,000.00	12.32% on $42,503,000.00	.....

FINANCIAL.

Capital Stock and Funded Debt.

The Capital Stock of The Delaware and Hudson Company on December 31, 1912, was $42,503,000, no additional shares having been issued during the year.

The Debentures of 1914, outstanding at the close of the year were $300,000, having been reduced by the payment, on January 1, 1912, of $200,000, maturing as of that date.

The amount of First Lien Equipment Bonds of 1922, outstanding December 31, 1912, was $9,694,000, bonds aggregating $4,000 having been retired during the year through the operation of the Sinking Fund established in connection with their issue.

Floating Debt.

The Floating Debt of the Company amounted to $3,500,000 on December 31, 1912, having increased $2,600,000 during the year. This increase was made necessary in order to finance temporarily addition and betterment work, and to cover advances to subsidiary companies for construction.

Sinking Funds.

During the year there was paid into the Sinking Fund under the First and Refunding Mortgage the sum of $277,040, being one per cent. of the par value of the First and Refunding Mortgage Gold Bonds outstanding May 1, 1912, making the total paid to date, $896,510. In accordance with the terms of the trust agreement, this money has been expended in additions and betterments to the property coming under the mortgage.

A summary of the operations of the Sinking Fund under the First Lien Equipment Trust Indenture, from the date of its creation to December 31, 1912, follows:

Receipts:		
Annual payments to Trustees, years 1908, 1909, 1910, 1911 and 1912, $650,000 per year	$3,250,000.00	
Interest on cash balances and investments	111,967.68	
Total		$3,361,967.68

DISBURSEMENTS:

Sixty-two locomotives acquired.....		$1,546,678.57
Five Milk Cars acquired.....	$17,000.00	
One Gas-Electric Car acquired.....	25,075.00	
One Pintsch Gas Transport Car acquired	2,500.00	
Two Gasoline Tank Cars acquired....	1,700.00	
One Snowplow acquired.....	5,040.42	
Fifteen Cabooses acquired.....	10,500.00	
		61,815.42
Three hundred and six (306) The D. & H. Co. First Lien Equipment Bonds purchased and retired (including accrued interest).....		312,170.64
Securities and Cash in hands of Trustees....		1,441,303.05
Total		$3,361,967.68

In accordance with the ordinance passed May 9, 1899, and amended at the annual meeting of stockholders held on May 10, 1910, there was accumulated in the Coal Department Sinking Fund $285,486.35. Of this amount $11,780.04 was applied toward the cost of coal lands purchased in the Wyoming section of Pennsylvania, and the balance was applied to the advances to The Schuylkill Coal & Iron Co. and the Shanferoke Coal Co. for the acquisition of anthracite coal lands in Schuylkill County, Pennsylvania.

DIVIDENDS.

On December 18, 1912, a dividend for the year 1913, upon the outstanding $42,503,000 of Capital Stock of the Company, at the rate of nine (9) per cent. upon the par value thereof, and amounting in the aggregate to $3,825,270, was declared out of the earnings for the current and preceding years, payable as follows:

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon February 25, 1913, and payable March 20, 1913.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon May 28, 1913, and payable June 20, 1913.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon August 28, 1913, and payable September 20, 1913.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon November 27, 1913, and payable December 20, 1913.

COAL MINING DEPARTMENT OPERATIONS.

During the year 1912 there were mined 6,438,555 gross tons of anthracite coal out of a total of 63,610,578 tons, including product of washeries, produced in the region. The amount produced by this Company is 842,384 gross tons less than for the year 1911, due to the suspension of work at the collieries from April 1st to May 21st inclusive, account of strike of employes.

As a result of the suspension above referred to, a joint sub-committee was appointed representing the Mine Workers on the one hand and the Anthracite Coal Operators on the other, which negotiated an agreement governing the relations of employes and employers in the Anthracite Region. This agreement provides that the terms and conditions awarded by the Anthracite Coal Strike Commission and supplemented by the agreements subsequent thereto shall be continued for a further period of four (4) years, ending March 31, 1916, except in the following particulars, to wit:

(*a*) The contract rates and wage scales for all employes shall be increased ten per cent. over and above the contract rates and wage scales established by the Anthracite Coal Strike Commission as effective April 1, 1903. The provisions of the sliding scale are by mutual consent abolished.

(*b*) All contract miners and laborers when working on consideration shall be paid not less than the rate paid Company miners and laborers at the mine where the work is being performed.

(*c*) There shall be an equitable division of mine cars as set forth in the award of the Anthracite Coal Strike Commission and the decisions of the Conciliation Board; and further, the rates paid by any contract miner to his employes shall not be less than the standard rate for that particular class of work.

(*d*) At each mine there shall be a grievance committee consisting of not more than three employes, and such committee shall under the terms of this agreement take up for adjustment with the proper officials of the Company, all grievances referred to them by employes who have first taken up said grievance with the foreman and failed to effect proper settlement of the same. It is also understood that the member of the Board of Conciliation elected by the Mine Workers organization or his representatives may meet with the Mine Committee and Company officials in adjusting disputes. In the event of the Mine Committee failing to adjust with the Company officials any grievance referred to them they may refer the grievance to the members of the Board of Conciliation in their district for adjustment, and in case of their failure to adjust the same, they shall refer the grievance to the Board of Conciliation for final settlement, as provided in the Award of the Anthracite Coal Strike Commission and the agreements subsequent thereto, and whatever settlement is made shall date from the time the grievance is raised.

(*e*) Contract miners shall have the right to employ check weighmen and check docking bosses, as provided by the award of the Anthracite Coal Strike Commission and the decisions of the Board of Conciliation, and when so employed their rights shall be recognized and they shall not be interfered with in the proper performance of their work; provided they do not interfere with the proper operation of the colliery. Check weighmen and check docking bosses shall be elected by contract miners in meeting assembled specifically for that purpose, and for such term as said miners may determine, and the chairman and secretary of said meeting shall certify such election to the mine foreman.

(*f*) For the purpose of facilitating the adjustment of grievances Company officials at each mine shall meet with the Grievance Committee of employes and prepare a statement setting forth the rates of compensation paid for each item of work under the provisions of this agreement, and certify the same to the Board of Conciliation within sixty days after the date of this agreement.

There are items other than changes in the wage schedule which tend to cause the cost of producing coal to increase from year to year;—shafts and slopes are sunk deeper, tunnels are extended, and the mined-out area increases; all of which lengthen the haul of coal in mine cars, requiring increased transportation facilities; increase the area to be drained of water, thus calling for more pumping facilities; increase the area to be ventilated, thus requiring enlarged ventilating appliances; and with it all requires more employes.

The thicker veins are gradually being worked out, so that an increased proportion of coal is coming from thin veins, and, in mining these, sufficient headroom must be provided to enable the miners to take out the coal, so that often an amount of rock greater than the body of the coal must be taken out.

There has been a steady increase in the percentage of steam sizes to the total production—increasing from 27.3 per cent. in 1901 to 38.63 per cent. in 1911. This has not resulted from decreased efficiency in mining, but on the contrary is due to improved cleaning appliances which enable the producer to prepare for the market small sizes which formerly went into the culm banks. It is also due, in part, to a conservation of the natural resources, in that the producer is now mining from the thinner veins, while formerly the mines were abandoned after the coal was taken out of the thicker veins, and by reason of cave-ins, which occurred after the coal from the thicker veins was mined, and which prevented the securing of a safe roofing, it became impracticable to subsequently mine the coal in these thinner veins.

The cost of production per ton of fresh-mined coal applies equally to all sizes, whether it be chestnut—the most valuable—or birdseye—the least valuable. In arriving at the cost per ton, a ton of birdseye coal is as much a divisor as a ton of chestnut coal. Inasmuch as the greater proportion of the increase in coal production has been in the smaller or less valuable sizes, such increased tonnage has contributed to keeping the average cost per ton of all sizes less than it otherwise would have been, but at the same time the increased resulting product is one of which the greater proportion is less valuable than the cost to produce it.

Taxes have been increased, so that they are about four times in excess of the amount paid in the year 1901, and this notwithstanding the constant decrease in the unmined coal remaining in the ground. This increase is equivalent to three and thirty-eight hundredths cents per ton on the normal output.

Thus since the adjustment of the wage schedules and the sales prices of coal following the strike of 1902, there has been a constant increase in the cost of producing coal from year to year, due to the causes mentioned which was not counterbalanced by any changes in prices which were made during that period, so that the operating costs of producing coal of this and subsidiary companies, including taxes but excluding sinking fund for depletion of the coal lands, were higher in 1911 than in 1901 by $0.5575 per ton; while, on the other hand, if all of this product had been sold at Tidewater (the prices prevailing there being a fair indication of the fluctuations in prices which might take place in any other market), the increased price return of 1911 over 1901 would have been $0.4318 per ton. That is, the increased cost of production exceeded the increased price return by $0.1257 per ton and made it impossible to earn a fair return on the investment. Therefore, some increase in the market price of coal was necessary even though no increase in wages had occurred.

Assuming that in the year 1912 the mines had been operated under normal conditions, but with the increase of $0.0808 per ton in the cost of mining under the new wage scale, with an increase of $0.0338 per ton in taxes, and with the increase of $0.25 per ton in the market price of pea coal and larger sizes, and with no change in the market price of the smaller sizes (thus making an increase in the average market price per ton of all sizes of $0.1913), it would have resulted in an increase over the year 1901 of $0.6559 per ton in the cost of production and an increase of $0.6231 per ton in the market price—indicating a decreased return to the producer of ($0.0328) three and twenty-eight hundredths cents per ton.

Construction was continued during the year on the new colliery at Archbald, Pa., which, it is expected, will be completed and placed in operation in the Spring of 1913.

During the year the facilities were increased to correspond with the requirements of the mine working and development work continued in order to maintain the output.

The charges therefor to Extraordinary Expenses of the Coal Mining Department amounted to $857,975.42, as against $823,654.71 in 1911, as follows:

New Colliery at Archbald, Pa.....	$280,321.97
Sinking Shafts and Shaft Improvements.....	107,884.91
Tunnels and New Openings.....	83,892.24
New Engines, New Boilers, Boiler Houses and Fittings.....	69,965.30
Rope Haulage, Slopes, Planes and Ropes.....	59,892.04
Concrete Barns, etc.	58,220.19
New Pumps and New Pump Rooms.....	44,216.49
Electric Plants and Machinery.....	43,122.89
Tracks, Compressors, etc.	41,359.36
Other New Buildings	14,753.63
Improvements to Breakers and Washeries.....	7,196.78
Conveyors	1,028.46
Miscellaneous	46,121.16
Total	$857,975.42

RAILROAD DEPARTMENT.

OPERATING REVENUES.

The total increase in Revenues from operations was $1,058,286.12.

The Revenue from Coal Freight traffic increased $498,901.29, of which approximately eighty per cent. was from bituminous coal. Notwithstanding the suspension of coal mining operations in the early part of the year and a decrease of 1,285,711 net tons of anthracite coal carried, there was an increase of 55,345,183 in the total anthracite ton miles.

The Revenue from Merchandise traffic increased $423,062.90, the Revenue from Passenger traffic increased $57,277.54, and the Revenue from Miscellaneous sources increased $79,044.39.

OPERATING EXPENSES.

The total increase in Operating Expenses was $1,308,619.26. Maintenance of Way and Structures increased $451,595.56; Maintenance of Equipment increased $170,003.13; Traffic Expenses increased $39,468.78; Transportation Expenses increased $564,969.82, and General Expenses increased $82,581.97.

The ratio of Operating Expenses to Operating Revenues in 1912 was 62.57 per cent., as compared with 59.56 per cent. in 1911. The increase was partly due to the complete shut-down of all of the anthracite mines from April 1 to May 21, 1912, pending a settlement of the wage dispute, which caused a substantial reduction in the Company's revenues for those months, while it was impossible to decrease the expense proportionate with the loss of traffic.

In January and February, 1912, the weather conditions were unusually severe and resulted in increased operating costs.

The increase in the Maintenance of Way and Structures Expenses was chiefly due to an increase of $191,984.09 in Rails, Ties and Other Track Material; also, to an increase of $187,941.28 in Bridges, Trestles and Culverts which was made necessary by addition and betterment work inaugurated to provide for use of heavier power.

The increase in the Maintenance of Equipment Expenses was due to an increase of $130,468.00 in Locomotive Repairs and an increase of $60,169.42 in Freight Train Car Repairs—the Locomotive Repairs resulted from 595,558, or 4.44 per cent., more miles run by Locomotives, and an increase of 5 per cent. in the tractive power of locomotives repaired—the Freight Train Car Repairs resulted from an increased cost of material for repairs and 4,081,505, or 2.58 per cent., more miles run by freight train cars.

The increase in the Transportation Expenses resulted largely from the

increase in business handled. The increased price of fuel resulted in an additional cost of $139,803.65; the increased wages paid to engineers amounted to about $18,000, for the last eight months of the year, under the arbitration award; the increase in Personal Injury Claims paid amounted to $39,695.17, although the number of settlements was less, thus showing the effect of legislation and agitation respecting employers' liability.

Early in the year 1912, the Brotherhood of Locomotive Engineers in behalf of the engineers employed on fifty-two railroads in the eastern section of the United States presented a concerted request to the managements of these railroads for a general increase in wages and for certain modifications in the rules governing their employment.

The matters in dispute were finally submitted to a Board of Arbitration of seven members, one selected by the railroads, one by the Brotherhood of Locomotive Engineers, and the other five were selected by a committee consisting of the Chief Justice of the United States, the Presiding Judge of the Commerce Court, and the United States Commissioner of Labor.

The Arbitration Board fixed the minimum rate for engineers in passenger service at $4.25 for 100 miles or less; miles made in excess of 100, pro rata. Overtime to be computed at 20 miles per hour; paid for at the rate of 50c. per hour. Overtime computed on the minute basis.

The minimum rate for engineers in freight service was fixed at $4.75 for 10 hours or less, or 100 miles or less; miles made in excess of 100, pro rata. Overtime in freight service computed on the basis of 10 miles per hour, and paid pro rata on the minute basis. 25c. per 100 miles or less to be added for local freight service, to through freight rates, according to the class of engines. Miles over 100 will be paid pro rata.

The minimum rate for engineers in switching service was fixed at $4.10 per day, 10 hours or less to constitute a day's work; all time over 10 hours to be paid pro rata; overtime computed on minute basis.

The Arbitration Board also established awards covering Electric Service, Belt Line or Transfer Service, time Engineers are held away from Home Terminal, time of beginning and ending of a day, Initial Terminal Delay, and Final Terminal Delay.

The awards were made effective as of May 1, 1912, except the award covering "Held Away from Home Terminals" and the award covering "Final Terminal Delay" which took effect November 1, 1912. The awards will terminate on May 1, 1913.

The Brotherhood of Locomotive Firemen, the Order of Railway Conductors, and the Brotherhood of Railroad Trainmen, on behalf of all the men engaged in engine and train service, other than the locomotive engineers, have presented a concerted request to the managements of the railroads in the eastern section of the United States for a general increase in wages and for certain modifications in the rules governing their employment. The demands of the firemen are equivalent to about thirty-five per cent., and those of the conductors and trainmen to ten per cent., of the present rates of pay.

An Arbitration Board has been selected under the provisions of the Erdman Act, for the consideration of questions involved in the demands of the Brotherhood of Locomotive Firemen. The demands of the Order of Railway Conductors and of the Brotherhood of Railroad Trainmen will be taken up for discussion by the General Managers' Association of New York, immediately after the Firemen's wage schedule has been disposed of.

ADDITIONS AND BETTERMENTS—ROAD.

A program has been inaugurated covering extensive bridge renewals and betterments in order to make all bridges on the line capable of carrying E-5 engines, the heaviest of the consolidation type. Part of this work was completed in 1912, resulting in charges to Additions and Betterments of $20,564.17 and to Operating Expenses of $123,363.07. The program calls for a total estimated expenditure of $414,308, of which $100,640 is chargeable to Additions and Betterments. The work will continue throughout the years 1913 and 1914.

During the year there were completed and put in operation the shops and terminals at Watervliet, N. Y., the coal storage plant at Glenville, N. Y., the round house and coaling facilities at Carbondale, Pa., the grade reduction and change of line Oneonta to Nineveh, N. Y., and the mile of double track north of Binghamton, N. Y., mentioned in previous Annual Reports.

New Passenger Stations at Lake George and Dannemora, N. Y., have been constructed and the freight house facilities at the latter place improved.

There is being constructed at the present time an under-crossing, including solid floor three track through girder bridge 78 feet in length, at Slingerlands, N. Y.; a concrete overhead bridge, concrete cattle pass and approaches, at Bainbridge, N. Y.; and an over-crossing at Robinson Street, Binghamton, N. Y.; all of which is being done in accordance with the orders of the Public Service Commission of the Second District, State of New York.

Substantial improvements in the station and yard layout at Sidney, N. Y., have been undertaken. When completed the improved facilities will be used jointly by this Company and the New York, Ontario & Western Railway Company.

The freight house at Green Island, N. Y., is being enlarged and additional tracks constructed, to care for the increasing traffic at that point.

ADDITIONS AND BETTERMENTS—EQUIPMENT.

As mentioned in the 1911 report, there is under way the work of equipping freight cars with steel underframes. There was expended on this work in 1912 $334,594.70. The program for 1913 contemplates the applying of steel underframes to 200 box cars of 60,000 lbs. capacity; 400 coal cars of 80,000 lbs. capacity, and 200 coal cars of 60,000 lbs. capacity, at an estimated cost of $369,600.

There were received during the year the three Mallet Articulated Compound Locomotives, the twelve Class E-5 Consolidated Locomotives, the five new Standard Steel-Underframe Milk Cars, the one Passenger and Baggage Gas-Electric Car, and the fifteen four-wheel Caboose Cars which were ordered in 1911; and, in addition there were acquired one Snow Plow, two Gasoline Tank Cars, and one Pintsch Gas Transport Car; all of which were paid for from funds accumulated under the First Lien Equipment Trust Indenture.

During the year 1912, the Board of Managers authorized the acquisition of fifteen Class E-5 Consolidated Freight Locomotives, and one 100-Ton Wrecking Crane; one Bridge Erecting Car and Trailer with the necessary equipment, for 1913 delivery; all of which will be paid for from funds accumulated under the First Lien Equipment Trust Indenture.

The total expenditures during the year on account of Additions and Betterments to the Company's Railroad (and including expenditures on account of the items mentioned above) amounted to $2,927,057.72, details of which are as follows:

ROAD:		
Right of Way and Station Grounds	$44,660.86	
Widening Cuts and Fills	9.26	
Protection of Banks and Drainage	3,875.51	
Bridges, Trestles and Culverts	22,457.64	
Increased Weight of Rail	47,990.51	
Improved Frogs and Switches	202.00	
Track Fastenings and Appurtenances	10,061.51	
Additional Main Tracks	4,368.50	
Sidings and Spur Tracks	434,255.36	
Terminal Yards	8,525.65	
Fencing Right of Way	2,393.17	
Elimination of Grade Crossings	7,089.16	
Block and Other Signal Apparatus	16,880.18	
Telegraph and Telephone Lines	3,324.55	
Station Buildings and Fixtures	69,639.84	
Shops, Engine Houses and Turntables	581,236.50	
Shop Machinery and Tools	366,511.54	
Water and Fuel Stations	75,798.87	
Other Additions and Betterments	6,303.40	
Work in Progress	613,173.12	
Total for Year		$2,318,757.13
EQUIPMENT:		
Steam Locomotives	$328,698.52	
Passenger Train Cars	7,538.35	
Freight Train Cars (*Cr.*)	89,139.86	
Work Equipment	12,370.37	
Work in Progress	348,833.21	
Total for Year		608,300.59
Grand Total 1912		$2,927,057.72

The Wilkes-Barre Connecting Railroad Company has been organized to construct a line of railroad which will effect a connection between the Pennsylvania Railroad and the lines of this Company near Wilkes-Barre, Pa. The capital stock of the new Company is owned jointly by the Pennsylvania Railroad Company and The Delaware and Hudson Company.

ALLIED STEAM RAILWAYS.

The Greenwich and Johnsonville Railway Company shows an increase in Operating Revenues for the year 1912 of $8,333.42 as compared with the previous year. The Operating Expenses show an increase of $3,643.80. The Net Income for the year was $25,824.12, an increase of $8,756.30 over 1911.

The Quebec, Montreal and Southern Railway Company shows an increase in Operating Revenues of $25,466.20 for the year 1912 as compared with the previous year. The Operating Expenses increased $16,109.96. The Net Income, independent of interest charges due The Delaware and Hudson Company, amounted to $156,378.98, an increase of $19,559.18.

The Napierville Junction Railway Company shows an increase in Operating Revenues for the year 1912 of $12,400.11 as compared with the previous year. The operating Expenses show an increase of $11,089.12. The Net Income amounted to $19,416.44 or 3.23 per cent. on the Capital Stock outstanding. The Operating Expenses increased by reason of the severe weather conditions in the early part of the year; also by extensive repairs to locomotives. Personal injury claims also increased $5,000.

ALLIED ELECTRIC RAILWAYS.

Increases in Net Operating Revenues were as follows: United Traction Company, $18,721.66; Hudson Valley Railway Company, $11,713.41; Schenectady Railway Company, $35,321.44. The Net Operating Revenues of the Troy and New England Railway Company and the Plattsburgh Traction Company decreased $2,578.61 and $2,598.37, respectively.

Dividends of 4 per cent. for the year 1912 were declared on the Capital Stock of the United Traction Company; 6 per cent. on that of the Schenectady Railway Company; 3 per cent. on that of the Troy & New England Railway Company, and 5 per cent. on that of the Plattsburgh Traction Company.

The United Traction Company has completed the work inaugurated in 1911 of placing feeder wires under ground. A high tension transmission line from Mechanicville Power Plant to North Albany, a distance of 17¼ miles, has been constructed, affording the Company direct transmission of current from the Mechanicville Power Plant to its various transformer stations at Albany and Troy, N. Y. The tracks have been extended on Ten Broeck Street, Albany, N. Y., Mill Street and Pawling Avenue, Troy, N. Y., for a distance of 6,054 feet, 1,450 feet and 2,692 feet respectively. During the year seventeen 16-ft. cars were lengthened to 21 feet, increasing the seating capacity from 22 to 28 passengers, or 27.3 per cent.; and three 18-ft. cars were rebuilt and lengthened to 21 feet, increasing the seating capacity from 24 to 28 passengers, or 16.7 per cent.

The Hudson Valley Railway Company has purchased three new passenger cars for use in interurban service between Albany and Warrensburg, N. Y., each with a seating capacity of 52 passengers; and has completed the work of paving Broad Street, Schuylerville, N. Y. The work of paving Lawrence Street, Glen Falls, N. Y., with asphaltic concrete pavement will be completed early in 1913.

ALLIED BOAT LINES.

The Operating Revenues of The Champlain Transportation Company show an increase of $5,359.85 and the Operating Expenses show an increase of $4,373.80 as compared with the year 1911, making an increase in Net Operating Revenue of $986.05 for the year.

The Operating Revenues of The Lake George Steamboat Company show an increase of $5,254.98 and the Operating Expenses show an increase of $16,917.36 as compared with the year 1911, making a decrease in Net Operating Revenues of $11,662.38 for the year.

The Operating Expenses increased by reason of the increased cost of fuel and food supplies and extraordinary repairs to boats of The Lake George Steamboat Company.

The new motor boat "Mountaineer" was completed during the year at a cost of $15,565.21.

Work is in progress on the new shops at Shelburne Harbor, Vt. There was expended on same $15,874.73 during the year.

HOTELS.

Extensive improvements have been made to the Fort William Henry Hotel, consisting of fitting up the Pergola and Bridge for shops and stores, making an addition to the kitchen, building a toboggan slide and hockey rink, and constructing a sewage system.

The Fort William Henry Hotel was open in 1912 from January 1st until October 20th and again opened for the winter season on December 20, 1912.

The Hotel Champlain was opened June 14th and closed September 29, 1912.

Both hotels experienced a successful summer season and notwithstanding the moderate winter weather the Fort William Henry Hotel is showing an improvement in business this winter as compared with the winter 1911-1912.

LITIGATION.

In the suit instituted by The Ticonderoga Railroad Company against this Company, mentioned in the annual reports of 1909 and 1910, the New York Court of Appeals has decided that this Company owes no present duty to The Ticonderoga Railroad Company, except to report the results of this Company's operation of the Ticonderoga Railroad, and to continue the annual payments heretofore made.

In other respects the situation of the litigated matters mentioned in the recent annual reports of the Company remains unchanged.

GENERAL REMARKS.

The Interstate Commerce Commission has proposed rates to be assessed by Express Companies on interstate merchandise express traffic, which would cause losses estimated at 25.2 per cent. of the gross revenues therefrom, and which would correspondingly reduce the express revenues of the Railroads. A hearing before the Commission on the proposed rates will be held during the year 1913, and data is now being prepared which it is believed will clearly indicate the injustice of making any general reduction, and that, at most, changes should be made only in such individual rates as may be necessary to bring them into harmony with the general schedule.

By an Act of Congress a Parcels Post was established on January 1, 1913, whereby packages not exceeding eleven pounds in weight may be forwarded as United States Mail. A large percentage of small packages formerly carried by express will probably be forwarded by mail.

The Post Office appropriation bill which became a law March 4, 1913, provides, that on account of the increased weight of mail resulting from the establishment of the Parcels Post, the Postmaster General is authorized and directed to weigh the mails, beginning September 1, 1913, and to readjust compensation from the date of the commencement of such weighing. It provides, also, for the discontinuance of the transportation of second class matter in freight trains. No provision has been made for compensation to the Railroads for the additional mail carried by reason of the Parcels Post between the date of its establishment and the date of the weighing.

While the increased mail pay resulting from the re-weighing of the mails will largely offset the loss in express revenues of the Railroads, it will not compensate them for the increased labor in handling the mails—the Railroads being obligated to handle, without compensation, all mail at transfer points, and also between the depots and post offices in all cities and towns where the distance does not exceed 80 rods.

Shortly before the close of the year the Interstate Commerce Commission announced its intention to make an investigation of all rates, rules, regulations and practices governing the transportation of anthracite coal. Inasmuch as anthracite coal constitutes over forty per cent. of the total tonnage handled by this Company, it is deeply concerned in the outcome of the proposed investigation.

In view of the constantly growing expense of operation, due to the demands of labor, to the increased cost of material, and to the new Federal and State laws, which to a large degree needlessly and unreasonably increase the number of employees—and with no corresponding increase in the freight rates—the following table indicating the investment which all of the carriers reporting to the Interstate Commerce Commission have made in property devoted to public use and their return on the total investment and on the new money going into the property since June 30, 1907 (the date the new Operating Expense accounts of the Interstate Commerce Commission became effective), is of especial interest:

	†1911.	1910.	1909.	1908.	1907.
Cost of Road and Equipment	$14,984,796,837	$14,387,816,099	$13,609,183,515	$13,213,766,540	$12,940,379,220
Revenues	$2,852,854,721	$2,812,141,575	$2,473,205,301	$2,440,638,832	$2,570,795,058
Expenses	1,976,331,864	1,881,879,118	1,650,034,204	1,710,401,791	1,737,698,201
Net	$876,522,857	$930,262,457	$823,171,097	$730,237,041	$833,096,857
Taxes	102,657,157	98,034,593	85,139,554	78,673,794	79,640,013
Operating Income	$773,865,700	$832,227,864	$738,031,543	$651,563,247	$753,456,844
OTHER INCOME:					
Hire of Equipment—*Cr.*	13,616,738	11,802,699	8,118,416	14,140,351	.....
Joint Facilities—*Cr.*	18,903,462	17,531,307	15,215,611	13,890,179	.....
Total	$32,520,200	$29,334,006	$23,334,027	$28,030,530	.....
Total Income	$806,385,900	$861,561,870	$761,365,570	$679,593,777	$753,456,844
INCOME DEDUCTIONS:					
Hire of Equipment—*Dr.*	$31,345,508	$27,647,038	$24,794,781	$21,660,850	.....
Joint Facilities—*Dr.*	30,371,290	28,819,675	26,111,803	23,136,983	.....
Total	$61,716,798	$56,466,713	$50,905,584	$44,797,833	.....
Net Operating Income	$744,669,102	$805,095,157	$710,458,986	$634,795,944	$753,456,844
Per Cent on Cost of Road	4.97%	5.59%	5.22%	4.80%	5.82%
Increased Cost of Road over 1907	$2,044,417,617	$1,447,436,879	$668,804,295	$273,387,320	.....
Increased Return over 1907	*$8,787,742	$51,638,313	*$42,997,858	*$118,660,900	.....
Per Cent. Increased Return to Increased Cost of Road.	*0.43%	3.56%	*6.43%	*43.40%	.....

†Although the 1911 Report has not been published, we were able to get the information by sending a representative to the Commission. The 1912 figures, although in the hands of the Commission, have not been compiled, so that 1911 is the latest information available.

*Decrease.

NOTE.—The following amounts were deducted from the 1907 figures shown in the Interstate Commerce Statistics, as they represent the figures for switching and terminal roads; while subsequent reports of the Commission excluded such roads and the data is unobtainable: Road and Equipment, $90,065,108; Earnings from Operation, $18,310,520; Operating Expenses, $11,117,613; Taxes, $672,362.

It will be noted that the investment in Road and Equipment increased approximately $273,000,000 in 1908, $395,000,000 in 1909, $779,000,000 in 1901, and $597,000,000 in 1911, so that on June 30, 1911, the investment in the property devoted to public use was, $2,044,417,617 in excess of the investment on June 30, 1907.

Comparing with 1907, there was available for interest and dividends approximately $119,000,000 less in 1908, $43,000,000 less in 1909, $52,000,000 more in 1910, and $9,000,000 less in 1911.

In other words, the year 1910 was the only year in which the railroads received any return on the new money going into their property devoted to public use, and in that year they received only 3.56 per cent. on the increase of $1,447,436,879 in the cost of Road and Equipment on June 30, 1910, as compared with the cost on June 30, 1907, while in no year did the rate of return on the total investment equal the 5.82 per cent. earned in the year 1907.

It will be noted that the taxes for the year 1911 increased approximately $23,000,000, or 29 per cent over the year 1907.

The necessary annual increases of capital investments by railroad corporations of the character above indicated must be largely made through new issues of long term securities. Such securities will hereafter be placed with some difficulty at such rates of interest as the companies can afford to pay, unless there can be secured to the carriers a fair rate of return upon the cost of the improvements to their properties.

By order of the Board of Managers.

L. F. LOREE,
President.

*Unexpended balance from proceeds of Bonds deposited with Trustee to defray cost of authorized Additions and Betterments.

†Decrease in Real Estate caused by Railroad Real Estate transferred to Road and Equipment—The D. & H. Co. This transfer also accounts for the large increase in Road and Equipment—The D. & H. Co.

BALANCE SHEET.

Items.	ASSETS. 1912.	1911.	Increase or Decrease.
Unmined Coal Owned and Controlled	$16,397,240.93	$16,667,697.24	—$270,456.31
Advances on Unmined Coal.	354,033.35	361,129.71	—7,096.36
Real Estate	805,850.47	4,846,119.40	—†4,040,268.93
Road and Equipment—The D. & H. Co.	65,814,079.28	58,858,151.17	†6,955,928.11
Road and Equipment—Canadian Lines	6,331,867.72	6,308,139.71	23,728.01
Floating Equipment	6,726.00	31.00	6,695.00
Coal Mining Department Equipment, Cars, Motors, Mules, Horses, etc.	1,303,362.30	1,263,292.17	40,070.13
Coal Handling and Storage Plants	61,134.46	95,877.17	—34,742.71
Stocks and Bonds	27,088,093.56	27,014,189.46	73,904.10
Cash	1,182,559.75	1,921,783.81	—739,224.06
Fire Insurance Fund	373,904.51	336,723.56	37,180.95
Cash and Securities in Special Reserve Funds	9,738.00	9,393.00	345.00
Equipment Trust Fund	1,441,303.05	1,196,135.31	245,167.74
*Special Deposits	.....	596,678.43	—596,678.43
Supplies on Hand	2,781,672.78	2,885,682.49	—104,009.71
Bills and Accounts Receivable	4,118,196.86	2,790,468.68	1,327,728.18
Advances for Construction and Acquisition of New Lines.	3,427,607.68	2,047,128.62	1,380,479.06
TOTAL	$131,497,370.70	$127,198,620.93	$4,298,749.77

Items.	LIABILITIES. 1912.	1911.	Increase or Decrease.
Capital Stock	$42,503,000.00	$42,503,000.00	
Bonds as follows:			
1st and Refunding Mortgage Gold Bonds, 1943, 4% $27,704,000			
1st Mtge. Bonds, 1917, 7% 5,000,000			
The Adirondack Ry. Co. 1st Mtge. Bonds, 1942, 4½% 1,000,000			
Schenectady & Duanesburgh R. R. 1st Mtge. Bonds, 1924, 6% 500,000			
Debentures, 1916, 4% 13,973,000			
1st Lien Equipment Bonds, 1922, 4½% 9,694,000			
Debentures, 1914, 4% 300,000			
	58,171,000.00	58,375,000.00	—$204,000.00
Loans Payable	3,500,000.00	900,000.00	2,600,000.00
Interest, Dividends, etc., Accrued	1,405,209.12	1,371,743.86	33,465.26
Interest, Dividends and Bonds due and not yet collected.	195,086.81	210,796.31	—15,709.50
Taxes Accrued	157,041.56	109,644.57	47,396.99
Special Reserve Fund Accounts	9,738.00	9,393.00	345.00
Audited Vouchers and Pay Rolls	3,052,053.77	2,773,500.85	278,552.92
Other Accounts Payable	552,479.93	707,107.15	—154,627.22
Appropriated Surplus—Additions to Property prior to June 30, 1907, through Income	6,751,837.48	6,751,837.48	
TOTAL LIABILITIES	$116,297,446.67	$113,712,023.22	$2,585,423.45
General Profit and Loss, being excess of Assets over Liabilities	15,199,924.03	13,486,597.71	1,713,326.32
TOTAL	$131,497,370.70	$127,198,620.93	$4,298,749.77